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A

# RATIONALE OF THE LAWS OF CEREBRAL VISION;

COMPRISING THE LAWS OF

SINGLE AND OF ERECT VISION,

DEDUCED UPON THE PRINCIPLES OF DIOPTRICS.

BY JOHN FEARN, ESQ.

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HE THAT FORMED THE EYE; SHALL HE NOT SEE?

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TO THE

# PHILOSOPHERS OF FRANCE.

Gentlemen,

After having passed the latter half of a life in studies, concerning which there are at least ample vouchers that I did not mistake the propensity; I find myself compelled to appeal the following Essay, from the anticipated neglect of my Country, to the scientific justice of a Foreign Nation—the Nation of Mons. de la Hire and of a Constellation of Philosophers of the Mechanism of Vision.

That I am driven to this appeal, would certainly be ignominious to my intellectual pretensions, were it not a fact too well known, that the apathy of living Englishmen toward abstruse science in general has become a theme in the mouths of reflecting persons, both at home and abroad. Nor is the general apathy the sole external cause of the predicament in which I stand; since I, together with the Subject, suffer rather from obstacles that form a barrier between me and the Public, than from the prevailing indisposition toward such walks of research. The brief truth of the matter is, (and the present limits oblige me to announce it with the utmost brevity,) a hurtful difference has subsisted between myself and a Name that (owing to a combination of circumstances) is of a Colossal Influence in this Country in those departments in which I have been occupied, and especially in the estimation of almost the whole of the arbiters of philosophical criticism among us: And this difference, consisting in a two-fold matter,—namely—of philosophical views, and of personal concern, has operated in closing up against my labors all the principal avenues of periodical notice; insomuch that, it must be impossible for works of their description to reach the eye of Europe under such proscription, unless through the intervention of some fortunate accident, or extraordinary recourse.

From a stranger, and a foreigner, you will peremptorily demand some credential of the assertion now advanced. I wish it were possible for me only to refer you to the various publications in which its vouchers are to be found. But, as this may not be; I supply that which follows, since it involves, in the smallest room, much of the nature of the case; and is far more essentially explicit than any other single passage which could be afforded. The testimony to which I now allude came forth in consequence of my having, some time back, deemed it expedient to have a full statement of the matter in question laid before the public: an opportunity of doing which was spontaneously afforded me in a work that was expected to prove of general favor; which, however, on its appearance, was made obnoxious to much adverse criticism; but, of the tenor of which I had not any previous knowledge; while the subsequent production of a Second Volume shows at least its Author's feeling with regard to it. Among the criticisms which it occasioned; One Periodical Work, whose respectability has long been sufficiently acknowledged, but of any of the Gentlemen concerned in which I know not so much as the name, has expressed itself in the following terms, which I here yield to transcribe under the imperative necessity of the case; while I must not omit to add that, the Publication to which it refers contains a genuine statement of the matter in question, which must always form a record of the case, and will be matter of interest in the history of the subject.*

"The only portion of its contents that can be considered of any real importance," (says the Writer of the Article,) "is the account furnished by Mr. Fearn of his

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* "*Parriana, or Notices of Dr. Parr.*"

"correspondence with the late Professor Dugald Stewart, "which might certainly, however, have been laid before "the world through the medium of any other publication "of the season, with quite as much appropriateness as "through that of the present. We shall be glad, how- "ever, if even this rather awkward proclamation of his "existence should have the effect of calling any measure "of public attention to the speculations of a philosopher, "who has shown at least as high powers and as much "originality as any other metaphysical inquirer of the age, "while he has had to prosecute his investigations under "the discouragement of a neglect that is any thing but "creditable to the taste and discrimination of his country- "men. This is not the place to enter into any discussion "of Mr. Fearn's peculiar opinions; but we cannot help "saying, that the treatment he experienced from Mr. "Stewart, as here detailed, reflects no honor upon that "distinguished writer. His claim to originality, in re- "gard to the particular position which Mr. Stewart af- "fected to consider as having so little merit in point either "of novelty or importance, was long ago maintained in "this Journal, and is put beyond the reach of controversy "by the statements here published."*

MONTHLY REVIEW *for September*, 1828,—*Page* 88.

When it is added, here, that the late Professor Stewart,

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* The more truth there may be in the remark on the *awkwardness* of my being fain to embrace a conveyance inappropriate to Pneumatological discussion; the more manifest is the state of Pneumatological labor in this Country.—The Vehicle, adopted, was embraced in consequence of its Author's application, that I should furnish him with any Letters I had of the late Dr. Parr. While, in complying with that Gentleman's request, the very Letters in question exhibited, in a confused way, several of the merits of the case: And I hope it will be deemed that few of the acts of Dr. Parr shed more lustre on the uprightness of his character, than his conduct in this controversy. I confess, therefore, that I really supposed the Vehicle would be deemed a suitable one.

(under whatever feeling,) in I believe the latest page of his latest work, though basking on a pinnacle of literary fame, chose to avail himself of the testimony of Dr. Parr to both the intellectual and the moral cast of his character; I trust, no honorable mind will deny that I am as justifiable, and more urgently called upon, to adduce the above testimonial in my own behalf. And, as I have been thus led to mention the Name of an Individual who was especially characterised by moral rectitude, as well as by erudition; and one who was the avowed friend and admirer of Professor Stewart, but who nevertheless expressed his disapprobation of his procedure; I shall add, to the foregoing testimony, a single expression of Dr. Parr, in one of his Letters to me, now before the public in the Work referred to. In that Letter, he says—"If Stewart deal out "a scanty portion of justice to you, leave him thus far to "the disapprobation of wise and good men."

Gentlemen. The late Professor Stewart left this World without dealing out to me, or at least without *acknowledging to the* PUBLIC, the smallest portion of justice. And, what is more; I must beg of you to be informed that the injustice, to which alone Dr. Parr alludes, was *only upon general philosophical* ground: for he, (I suppose from amicable considerations,) *did not expressly speak to the personal* claim in question; which last, however, was of the most vital importance in my case.

In closing this statement; I would not have it understood that I am less ready, than any one, to bear acknowledgment to the intellectual merits and high general character of the late Professor Stewart. Nor, on account of the Subject in question, would I have it supposed that there was any thing hostile in the conduct of our difference. The expressions of Mr. Stewart, in one of his letters to me now before the Public, are indeed of a tenor highly gratifying; and such as might have been eagerly caught at by any individual, who had not staked his life to the attainment of an object incompatible with its exchange for the private friendship of any man.

In fine. The matter to which I would now immediately solicit the favor of your decision is—Whether the following Essay on Vision is, or is not, in any extent, a contribution to Science. If your answer should be in the affirmative; then, I may presume, it ought to be supposed, by the reading public, that the tenor of my former labors is not altogether such as would be for the interests of mankind to neglect. And, if the present specimen should merit your unqualified censure; I shall be content, (although its Preface will explain that the matter is *not my subject*,) to have it supposed that my previous writings are of no better complexion.

The evil to be rectified, is not merely if I am wronged of my philosophical rank or estimation in the community. For, when much has been written, there may be much to explain, or emend: And great detriment might arise to general truth from a want of such explanation. While I need not inform you how fatally life is undermined, and the power of thought itself paralysed, by the amount of obstruction against which I have had to labor.

I have the honor to subscribe myself,

Gentlemen,

With profound respect,

Your Most Obedient Servant,

THE AUTHOR.

To

# HENRY BROUGHAM, ESQ. F.R.S. M.P.

## *&c. &c. &c.*

SIR,

WHILE I am compelled to appeal the labor of a speculative life to the adjudication of enlightened foreigners; I ought not to forget that there are in our own country eminent individuals, who, in all probability, are not aware that such a case exists; and who, if distinctly called upon, would not have permitted its occurrence. And, while there is not any one who stands so distinguished for having given an impulse to the literary spirit of the country, or who possesses equal power to effect right in such a case, as yourself; I might be wanting in what is due to you, were I not to include you, in my imagination, among the number of those that are most liberal; though I sufficiently calculate upon the existence of considerations which, if possible, would incline you not to stir in the matter.

Be the result what it may; I will not lower the moral ground on which I have labored, to place myself in a posture of solicitation,—a course which various feelings forbid. But, with every due admission, of which I am by no means disposed to lose sight, I would look toward you, provided the selection be worth your acceptance, for an act of justice; in which, indeed, I am concerned especially beyond other men; but which, if the cause be that of general truth, is a cause of no private nature.

From the tenor of the address which precedes this, it appears that I complain of literary oppression, in the shape of a continued obstruction to the promulgation of my speculative views, by a marked and portentous silence in the higher Quarters of Criticism with regard to whatever comes forth under my name. As far as regards my Pneumatological writings; I may be told that mine is only a common lot, in their not having been taken up in the leading Vehicles of Criticism. And I am so sensible of the truth of this, that I should never have made it a topic of specific complaint. But, a very different consideration urges the present appeal. The fact is that, my speculations in Pneumatology have formed not any thing like the whole of my labors. And a period of no less than seven years (including intervals of borne-down health) has been occupied in the exclusive prosecution of an Analysis of Language: which now, for some time, languishes before the Public, from a want of that aid which alone could bring to the notice of Europe any Philological work that diverges far from the usual track, especially when, as in my peculiar case, it is the production of an ungraduated author, and one who, more than any man, has been abstracted from the events, and the parties, which give security, or return, to literary exertion. Nor can the case be esteemed the less hard when the subject of Language, in every modification, and gradation of its treatment, is daily issuing from the press; and is deemed of sufficient importance to find effectual periodical notice.

It will be said that, what I have now advanced affords no proof that the work in question is deserving of better treatment than it has received. To this I answer, first; that I pledge myself, (without any previous intimation to the parties of my intention to do so,) that the houses which publish for me have had ample testimonies, from persons strangers to me, that the tenor of the work justifies my urging its claims to consideration.—But, besides these, there is, by a fortunate accident, *One* Public Criticism extant upon the work, although it is a locked-up one; to which I may refer.—Nearly the whole of the article *Philology*, in the CYCLOPÆDIA EDINENSIS, is occupied by an account of its *First Volume*, the Second not having then been published.—If, in this case, either the impartiality or the competency of the Writer of the article be questioned; it is for the " Society of Gentlemen " who have been engaged in that Cyclopædia (any one of whom, even by name, at the time I knew not, and now hardly know,) to answer to the Public that they did not intrust that department of their undertaking to an improper hand. But, their defence is rendered unnecessary by the details of the criticism itself; which, to any person in the subject, will pronounce its own sentence, whether or not it is a fair, or a competent one.—I trust, I need go no farther, in order to satisfy any well-informed mind that the Monthly Review has spoken truth, in its assertion that I am a sufferer under some influence which does not raise the literary character of the country.

And here I avow the unshaken reliance that, what I have done is at least sufficiently known to secure justice from those who shall come after us. But much detriment to the subjects in question, as well as to me, will intervene if they can be made to wait till then. And, if this wrong shall be accomplished; I hope, I meet your own feeling of the matter in auguring that, there is no Contemporary Name, of which posterity will so primarily ask, whether or not justice was done at the time, as of yours.

Fortunately; the Principles of Dioptrics (*which I nowhere contradict,*) are not only long-established truths; but, in addition to this, they are understood by a comparatively large class of persons, in every country; insomuch that, any matter deduced legitimately upon them cannot, from any accident, remain long in obscurity.

I have the honor to be,

Sir,

Your Most Obedient Servant,

JOHN FEARN.

# PREFACE.

If the Series of Propositions, laid down and argued in the following essay, be found legitimately deduced from their data; it will appear that the Chain of Visual Mechanism which connects a perceiving mind with the sun, or with any other luminous or light-reflecting body, consists of two very different parts;—the one being continued, in a line from the other, by what may be called a *visual articulation* between the two, consisting in the *retina* of the eye:—And the process carried on in the ANTERIOR part of this chain will demand the appellation of LUCERNAL Vision; while that which takes place in the POSTERIOR part will require the distinctive term—CEREBRAL.—Hence, the choice of the Title prefixed to these pages; and to explain which, this introductory remark forms the leading suggestion.

The nature of that half—(for such it may be called)—of the visual chain which exists and operates anterior to the eye, has been investigated with the most brilliant success during the course of the last two centuries. But a very different fate has hitherto befallen the other.—Cerebral Vision (in the hidden recesses of which, most certainly, are contained the mechanism and process of *Single and Erect Vision*) has, in a most astonishing manner, remained an arcanum in philosophy. And it would seem as if the failure of Newton, in his endeavor to throw any light upon the subject, had rendered it altogether hopeless in the eyes of other inquirers, since nothing notable of the kind appears to have been attempted after the hypotheses left by him, and by Dr. Briggs.

It has formed a characteristic feature, in the scientific spirit of the last age, to *pay no regard to a general con-*

*summation or consistency of knowledge.* But it may with confidence be anticipated, that, when Truth is violated by assumptions, or positions, in one science; which run counter to the immutability of her nature, as manifested in another; She will, sooner or later, do right to herself, with a re-action proportioned to the wrong which had been offered to her.—I suppose that the principal assisting reason why I have not been anticipated, in the investigation of a field which is of a nature as strictly demonstrable as the Laws of Dioptrics, has been a procedure to which I have adverted in a recent publication—namely—that, when Natural Philosophers are exhibiting their experiments, explanatory of the radiation, the refraction, or the reflection of light;—(that is, in other words, explanatory of the *very existence* of light, together with that of its *composition* and *decomposition,*)—they *never advert to a fact,* which however not one of them would for a moment attempt to deny—namely—that they *do not, and never in any case can,* PERCEIVE light; which means that they *never perceive the facts or phenomena which they profess to demonstrate;* and the ONLY THING which they DO perceive in this case,—*and* PERCEIVE IT DECOMPOSED, *and* RECOMPOSED, as often as they employ a prism,—is a SENSATION, *or* A COMPANY OF SENSATIONS, OF COLORS IN THEIR OWN MINDS. From this cause appears to have arisen the universal assumption of Natural Philosophers, that the *Object of our Sight is* "LIGHT," as well as COLOR. And, by this nomenclature and classification of subjects, those who have held the beaten track have been prevented from all attempts to discern any physical mechanism of vision, *except only in the external laws of* LIGHT; because this external agent has been confounded under one same general name with the modifications of the Mind itself, in the fact that *Colors* are estimated as being the *Various Species of Light.*

It would be vain, here, to attempt to put in a plea on the score of the *ambiguity of language.* For, although the fact of the ambiguity of language, if alleged, is by far too true; and, though the existence of it has proved a stumbling-block in the subject which indispensably requires to be removed; it is in great part *an effect*, rather than *the cause*, of the confusion which obtains with regard to the subject. And the real evil in question consists in a confounding in men's CONCEPTIONS of the *external physical cause* of color, with *color itself.*

To the Philosopher, and to all other men, Light is an Object of Sight in the same sense as the Unseen Pole is an Object of the Mariner: Which so-called object the Mariner *never perceives;* but which he knows as an OBJECT OF HIS REASON OR UNDERSTANDING, which tells him that the Pole *exists*, and *how it bears from him;* while, all that he *actually perceives* with regard to it is the *Magnetic Compass in his Binocle;* by observation of which, he steers toward, or from, or wide of, his unperceived object. According to the fact, now asserted; it will form a stated, and I trust a demonstrated Proposition, in the course of the following essay, that, "*A Spectator* "*perceives external objects, as the Mariner perceives the* "*Pole; and each steers toward, or from, or wide of, his* "*object, upon one and the same principle.*"

It is far from being intended here to assert that the confusion in the conception of inquirers has been either *total*, or in any extent *continual*, or *in equal degree in all* Writers on the subject. I should have no objection, even, if it were affirmed that some Writers have, *in one sense*, never at all lost sight of the distinction necessary to be made between the *things*, if not between the *names*, in question. But, I must nevertheless insist, it has been sufficient in *all*, to prevent any one from discerning that the dioptrical laws of light indicate, *as matter of indisputable logical necessity, a perfectly analogous train of mathematical reasoning, as being equally applicable to* LUCERNAL *and to* CEREBRAL *Vision.* While it is a fact, sufficiently recognised, that a Mechanism within the

Brain is, *in some way or other*, instrumental in the visual process.

Although the considerations, here suggested, impress me so strongly *now:* Still, I acknowledge, the nature of Cerebral, or of Erect vision, has never, until of late, been an object of my serious investigation. Not having supposed that any considerable path could have been left untrodden, in a field so repeatedly explored as that of the several Modes or General Cases of Vision, including all their various ordinary phenomena; I was all along led to take Optical expositions as I found them. And, although I was by no means satisfied with that violent hypothesis which assumes the evidence of Sight to be reversed by the Judgment; and this, without its being pretended that the Judgment is at all aware of its own arbitrary infliction; I considered any advance in the matter as being hopeless, insomuch as to have felt little, or no relish for the inquiry.

The only exception to this usual state of my mind, with regard to the subject, was that, occasionally, my attention was drawn to a certain Mode or General Case of my own vision; which struck me as being very different from any of those that are usually recognised by Optical Writers. But, always supposing that this different case must have been adverted to, and have been found to lead to *no consequences* worthy of having its specific difference described; I as repeatedly suffered the thing to pass from my mind, without farther regard. Indeed, during all this time, I had been so completely absorbed in attention to the phenomena of *mind only;* including the number of years I was occupied with the prosecution of my Analysis of Language, and during which I have had continually and almost hopelessly to struggle against a morbid incapability of application; that I might here offer a true and a serious apology for having suffered various objects of my wish to remain in a state equivalent to non-entity, as well as having neglected that now in question.

At length, the conviction forced upon my mind by the rationale of the laws of the *Mutual Interlimitations of our Sensations of Colors by each other;* (which Interlimitations, it will appear in their statement, are no other than the things we call *Visual Outline or Figure;*) led me to observe a certain analogy, of SIZE *at least;* and, when duly understood, of *superficial magnitude and arrangement;* of the Cerebral Masses called the *Beds of the Optic Nerves,* in correspondence with the superficial extent of the *retinæ of the eyes;*—a mere hint of which analogy I expressed, recently, in my Manual of the Mind. And the train of thought, consequent upon observing the correspondence in question, recalled to my attention, with some interest, that Mode or General Case of Vision which I had before noted as being different from any of those that are usually recognised.—In brief; I had hardly directed my attention in this extent to the matter, when I was greatly surprised to find that it afforded a remarkable contradiction of the existing doctrine concerning erect vision.

Such is the history of the following Rationale; and the explanation why it was so late in the course of my speculations that the thing in question has been advanced.

The admirable structure and utility of the eye has been a theme of wonder with the best men and wisest Philosophers; who have held its contrivance as being, of itself alone, a sufficient barrier against the errors of Atheism. What has been said of Anatomy, taken as a whole, may indeed be truly affirmed of this one minute part of it—namely—that it is a Hymn to the Creator.—If the steps of the following reasonings are legitimately deduced; or, rather, if three, or four, of the principal propositions are true; (and, I confess, I am not able to discern that there was any room for mistake in the deduction of them;) they possess the very same species and degree of proof, as those we have for the truth of the Dioptrical Laws of Light, that the *External or Cranial Eye,* wonderful as it is, is *only a Porch,* (of which two are bountifully supplied, to guard against accident to one of them,) before the Temple of

Vision: *in whose Interior is a* THIRD EYE,—the recipient of impressions first sustained by one or both of the external eyes;—and, by the medium of which, the mind perceives, *or at least steers with regard to*, external objects, in the way already hinted.

THE ARCHITECT OF THE EYE, most certainly, can see. But, if the proofs of the subject hold, he can do much more; for he can make his creatures wonderfully *believe that they see, what they see not;*—a deception which he beneficently confers upon both brutes and men *as a law of their mere animal nature*, because they must all exist and be preserved without the aid of philosophy; while he leaves it open to the possible attainment of human beings to discern the truth that, they can never *actually perceive* any thing exterior to their own modifications.

The proofs of the fact of our MEDIATE PERCEPTION OF EXTERNAL OBJECTS, which will here be drawn from Optical Science, form only another confirmation of what has been abundantly proved by the Science of Pneumatology.

That consistency, between the Sciences, the neglect of which was alluded to here in the beginning, will be found to be a matter of the very first moment to the existence of Philosophy. And the certain violation of it, in the incompatibility which subsists between the Pneumatological Creed of the present age and Optical Science as established since the days of Newton, will be pointed out in the sequel, as a fact of the most vital consequence to be held up in a proper light, for our future guidance.

*Torrington Square, London,*
15*th July*, 1830.

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# A
# RATIONALE,
# &c.

## INTRODUCTION.

### OF THE SCOPE AND LIMITS OF CEREBRAL VISION.

It is a fact universally acknowledged since the reasoning *à priori* of Bishop Berkeley and its confirmation by the results of surgical operations, that we *never perceive distance or outness from the eye*. And, hence, the Phenomena and Judgments of Vision become divided into *Primary* and *Secondary;* the former comprising Vision properly so called; and the latter forming a distinct and very different Science, in consisting of a collection of judgments consequent upon proper vision; which judgments, also, admit not of any rationale in their proofs, but rest for their evidence on mere experience,—a character which renders Secondary Vision in a great measure merely empirical.

It is true, however, that Bishop Berkeley, in the course of his speculations on Secondary Vision, has suggested and laid out an assumed exposition of the cause of Erect Vision. And his hypothesis, if it should be found unsolid, is at least very ingenious, and in some points specious. At any rate, it has, from the beginning, formed the prevailing, and indeed almost the only notable scheme of the subject extant.

With regard to the universality of the recognition that we never primarily see or perceive distance from the eye; the only exception to be named, as being avowed by any Writer of eminence on the subject, is that of Dr. Potterfield. And, upon his singular assumption, and reasoning on that assumption, that the distance of an object is in any case SEEN, there is a necessity to pronounce, it is sufficient to impeach the general philosophical calibre of any writer who should either advance, or countenance it. As such, that assumption was justly condemned by Dr. Reid; who was otherwise a sufficient admirer of Dr. Potterfield. And the oversight certainly detracts from the great general merits of the latter; or, at least, renders his other positions liable to a dubiety proportioned to the magnitude of the mistake.

With respect to the fact now in question, the agreement is so general, that it can hardly be requisite to offer an experimental proof of it here. Yet, on account of the single dissent of such a writer as Dr. Potterfield, I may state the following as a formal test of it: although a more strict and analytical test is comprised in the rationale of Visible Figure, which will be found in its proper place in this Essay.

If we look at a hoop, held in a position in which any of its diameters is co-incident with the axis of the eye, it will appear a *straight line;* no curve or projection from the eye being at all discernible in it. In like manner, if a pair of compasses be opened, until its legs are four, or five inches asunder; and if the compasses be held horizontally, with the points of the legs toward the eyes, they will present to sight no angle or depth: And, if each of the legs, including the joint between them, be covered with white paper, the whole will appear as *one straight stripe of white,* subtending the spread of the compasses.

This introductory consideration being entertained here for the sake of mere form, in an investigation which has avowedly for its object a course of strict proof, when not of demonstrative reasoning; I proceed to the divisions of the work.

# SECTION FIRST.

## INITIATORY REASONING UPON DATA AND METHOD.

### PROPOSITION 1.—NATURE OF THE EYE.

*An impression or image in the eye, of light projected from any external object, is a* TACTUAL, *and and is* NOT A VISUAL *image, in the primary and strict import of that word.*

PROOFS AND ILLUSTRATIONS.—It is self-evident, from the dioptrical laws of light, that if the retina of the eye were a *card, or a surface of any adapted consistency;* and if the rays of light projected upon it, from any external object, were pointed pins, striking upon it with various degrees of force corresponding with the different sorts of light; the result would be a *stamped image,* which would form an object of our *Touch.* And it is equally evident that, the same principle must hold true at every point of space, between the eye and the most distant object, even to the sun, or stars: For, if the rays of light were intercepted at any point, in all that distance from the eye, by whatever medium, they must form, in that medium, a *tactual* image of the nature described.

It is, at the same time a fact, concerning which there is no dispute in philosophy, that any such *tactual* image is NOT ALSO A VISUAL image, in the primary and proper import of the word visual: because, besides other proofs, it is universally agreed that those beautiful things which we call TINTS *and* HUES, and which appear to us to make up the *fields of the different features of any object or image* exhibited by the eye of a dead animal, are *nothing but sensations in the mind of a spectator*. This fact, indeed, has been very usually, and very mischievously, *overlooked at different stages in the course of optical inquiries:* but every optical inquirer, and every other philosopher, admits it the moment his imagination is chastened by having it called to his recollection. For the *convenience of reasoning*, the term—*visual image*—may be employed *in a secondary import*, as I shall currently employ it in the course of this Essay; because all the mechanism and operations that are *subservient* to vision may, in this secondary sense, be called visual. But a *Visual Image*, in the *primary and strict* import of the term, is *no other than a Sensation of Color, or a company of sensations of colors*; And VISION ITSELF is the PERCEPTION, BY THE MIND, *of those sensations*.

It follows, from this proposition, that, in the sense now explained, a Tactual Visual image on the retina, being that by which the *known dioptrical laws of light terminate their known operation*, is the *first fact in Cerebral Vision*. And the Retina is a *Common Surface and Articulation of Visual Mechanism*, between Lucernal Vision and Cerebral.

### PROPOSITION 2.

*The prepared eye of a dead animal, including its retina, when looked through from behind, is a* MERE REFRACTING OR DIOPTRICAL, *and is* NOT A REFLECTING OR CATOPTRICAL *instrument.*

PROOF.—The fact of our seeing (*as it is called*) in the eye of a dead animal, when we look at it *from behind*, an image of an external object which is in *front* of that eye, (when this fact is connected with that of the foregoing proposition,) renders the truth of the present one self-evident. And the illustration of this fact must be manifestly satisfactory; since any one, of a variety of familiar instruments, makes a very tolerable artificial eye, as will here be described.

A common opera glass, opened to its focus and inverted, forms an artificial eye: In which, any object *appears at a distance to an adept only;* for, to a *mere novice,* the object would, at the nearest, appear to be in the *eye-lens at the end of the telescope farthest from him:* and, by the contrivance of dimming the large lens, it may be brought to appear, even to an adept, as if "*painted*" *upon that lens,* precisely as it appears to be in the prepared eye of a dead animal.

Also, when a lighted candle is placed very near a muslin blind, in a bed-room window, (as it is often seen from the street, or from an opposite house;) this simple apparatus makes a very tolerable artificial eye for the purpose of shewing the general principle in question. For the flame of the candle *appears* to the spectator just as if it were painted upon the muslin blind. As far as regards the general principle, therefore, the Optician—Huygens—need not have been at the trouble to *invent* an artificial eye: for the image, in such an eye, or in a dead animal eye, is *no more painted in that eye*, than the flame of a candle is painted upon a muslin curtain. In a word; whoever was the discoverer of the telescopic principle, whether it was a philosopher, or a child, he made the very same discovery, a very little modified, as Kepler did when he first observed an image apparently in the eye of a dead animal. And, from all such examples, it is manifest, that the eye of a dead animal is a *mere refracting or dioptrical, and is not a reflecting or catoptrical instrument.*

### PROPOSITION 3.

*A human living eye, including its retina, can possess no visual mechanism, or property, other than is exhibited by a dead animal-eye when we look through it: Therefore, the human eye is* NOT A CAMERA OBSCURA *or* REFLECTING *telescope; but is a mere refracting or dioptric telescope.*

PROOF, &c.—1. Those philosophers, who have supposed the *choroides* to be the immediate organ of vision, must admit this organ of vision, at least in all cases wherein the choroides is *black*, is an *absorber*, and is *not a reflector* of light. Hence, according to those writers, the eye is not a reflecting telescope.

2. Those, again, who suppose the *retina* to be the organ in question, assume it as acting the part of a *white screen,* which *reflects* the images that are impressed upon it. But, if this be for argument's sake assumed for the moment; it must follow that, in order to constitute the eye a reflecting telescope or camera obscura, we must *get into, or at least* LOOK *into,* the eye; with our back toward the light, and our face toward the retina; which is impossible, and, moreover, is *manifestly contrary to the way in which we employ the eye.* Therefore, on the supposition last considered, the eye is not a catoptric or reflecting instrument.

This reasoning is fully confirmed, also, by the fact of our seeing directly, through a dead eye, any object beyond that eye, in the same sense that we see any object when we look merely with our own eye: for, it is impossible there should be any visual property in the last mentioned instrument, that is not in the first. Thus, a dead eye, being a compound lens, or refracting telescope made up of three conjoined lenses; when we look through a dead eye, in addition to our own eye, we look through *two* telescopes, joined in one continued line, instead of looking through one.

3. There is *yet a Third* supposition, to be adverted to here:—namely,—That the *choroides* is to the *retina,* what quicksilver is to a looking-glass; by which supposition, both the retina and the choroides become equally instrumental in vision.

But this conjecture cannot be tenable: because, it would not hold at all in any choroides that is *black:* And, if the choroides be supposed to be of any other color, so as to be able to reflect the rays of light; the retina, which, like an unsilvered glass, permitted the rays to pass through to the choroides, must equally be supposed to let the rays, reflected from the choroides, repass toward the pupil of the eye, instead of serving, by its posterior surface, as a screen to intercept them. And, lastly; if the retina be even supposed to *intercept* the rays with its posterior surface; and thus to reflect them *toward the perceiving mind, residing in the head;* the mind, thus situated, cannot possibly perceive in *immediate* consequence of an image expanded on the *retina, because the Bony Socket of the Eye is directly between it and the image.*

### PROPOSITION 4. RELATIVE PLACE OF THE PERCIPIENT.

*The Percipient Essence, considered with regard to its place in relativeness to any visual image in the eye, must be in an* OPPOSITE DIRECTION *to that of the external object which occasions the image; that is to say, the* IMAGE MUST *be* BETWEEN *the Percipient and the external object.*

PROOF.—This proposition is only the expression of a CERTAIN AXIOM, which is *tacitly assumed in all the dioptrical laws of light; and it is the sole foundation of the rationality of those laws:* For, unless it be regarded as such, the whole doctrine of the radiation, and refraction, and reflection, of light becomes a mass of unintelligible expressions.

And here we have the important consideration of fact, that, it is *not only sound Pneumatological Science* (as I have asserted on former occasions) that explodes a doctrine of the mind, which cannot possess so much as a moment's plausibility unless its advocates will go the length of denying that the Percipient Essence has *this, or that, or any other locality, whether absolute or relative.* The doctrine of the *inextension* of the mind, *which is the same thing as that of its non-relation to place,* has not only possessed an era in our own country; but, it has even begun to be disseminated and relished on the Continent of Europe. The consideration of OPTICAL SCIENCE ALONE OUGHT *to have been sufficient to save the intellectual character of the age from falling into such a predicament,* had that consideration but duly occurred to those concerned. If the genius of Newton could revisit the scene; and, were to witness his own assumed pneumatological disgrace, in having his Lockeian notions of mind held up, as a foil to the supposed luminous conclusions of his successors; Can there exist a doubt, but he would reply to them in some such language as that which follows?—And where is the Philosopher so profound, or so hardy, as could gainsay him were he to employ such terms:—"You have introduced a new and mys-
"tical doctrine of mind, unheard of, and uncon-
"ceived by any one, from the days of Plato
"down to your own time. You have not only
"agreed to sweep away the *Species of Aristotle,*

" and the *Ideas of Berkeley;* for which Philo-" sophy might have owed obligation to you, al-" though in fact, Locke had already done this to " your hand: But you have, *most untruly, and* " *astonishingly, confounded* the SENSATIONS *of* " *Locke;* (which he asserted as being NOT IDEAS " *in the scholastic and fallacious import of that word,* " *but as* MODIFICATIONS OF THE MIND ITSELF ;) " and have stigmatised these as being *parcel of the* " '*Ideal Theory;*' Than which, when duly under-" stood, no two schemes could be more foreign to " each other. And, exulting upon this imagined " pinnacle of attainment, you have exhibited with " derision my Optical query concerning visual " perception, in which I virtually own the belief " that the *species of things, (always meaning* SEN-" SATIONS *occasioned by external things,) are pre-" sent to the mind in the Sensorium:* Although, in-" deed, you did this with expressions of a general " veneration for my philosophical capacity; and " leniently seemed to rest the fault, not upon the " man, but upon the age in which he lived,—a " courtesy which only vaunts your own superior " genius.—But: Which of the two following " predicaments is fit;—namely,—That we em-" brace your doctrine of the mind; and thereby " explode Optical Science as a mere chimera; " in doing which, you will observe, we must also " annihilate, as if they had never been, all the " Optical inventions which have shed such light " upon the other sciences, and have embalmed " the truth of the laws of light to all future time: " OR, else, adopt the Lockeian doctrine of per-

" ception and sensations, purged as it was by him " of that fallacy which alone you can properly " call the '*Ideal Theory;*' and, by so doing, pre- " serve to the Sciences, and the Arts, the Diop- " trical Laws of Light, by preserving the MENTAL " CONDITIONS *in which alone they are founded?* " The most ingenious reasoner of your School, " I was about to say, will not pretend that there " is *any alternative,* in this case. But, I had " forgot the tacit understanding, in your age, to " afford *no thought to a general consummation of* " *knowledge, or consistency between the Sciences:* " And, upon *this* score, you have indeed an alter- " native, if you deem it expedient to resort to it: " which matter I shall mention here, in order that " Europe, in the Nineteenth Century, may have " from this single point of view a distinct discern- " ment of the fact, How far a following of your " Scheme would be turning the face, or the back, " upon Philosophy.—The result, to which I allude " is, if you will only assure your generation that " the Mind is to be considered as being of ONE " kind of Essence when we are in the SCIENCE " OF OPTICS; AND ALTOGETHER OF ANOTHER " AND INCOMPATIBLE KIND when we are in that " of PNEUMATOLOGY!"

In order to judge of the *force* of the reply which I have here presumed to put into the mouth of Newton; we have only for a moment to consider that, *without either expressly or tacitly assuming the* RELATIVE LOCALITY OF THE MIND, during every optical act, it is impossible to give intelligibility to the language we must employ concerning it.

To CONTRADICT this truth,—(a truth so certain and important that I shall make it the subject of another set proposition, farther on,)—would be IMPOSSIBLE: And, NOT TO BE AWARE *that we proceed continually on this assumption,* would be a reproach to every understanding that is employed on Optics.—How, then, is it possible to support a Doctrine of the Mind that is utterly incompatible with it?

Altogether apart from Optical Science, I may assume on general ground that, if there is a position which, more than any other, is requisite to preserve the human understanding from general and utter contempt; it is that asserted by Newton—namely—that, if it be necessary for a thing to exist WHEN it acts; it must be equally necessary that it exist WHERE it acts. The consideration which, since Newton's time, has been seized upon by the advocates of the Reideian Theory, that all *supposed contact of bodies is unreal;* is a plea which to the superficial reader must appear to possess much weight: And it has been valued upon accordingly. But that it is altogether nugatory, when duly considered, is perfectly manifest: because, no person will deny that, in every case of supposed collision of two bodies, there is a CERTAIN AND INVARIABLE PROXIMITY of the two bodies: and PROXIMITY IS A RELATION OF PLACE; so that we may believe there is a *real* contact of the unsolid elementary spheres which constitute the bodies; although we have no means of detecting this ultimate and real contact. It is beyond the possibility of a cavil that, unless the advocates of the Reideian doctrine could deny the INVARIABLE PROXIMITY which takes place in the case of physical action by collision, any attempt to deny real contact can avail them nothing in the judgment of those who are competent to the subject.

If, then, the answer upon Optical ground, assigned here to Newton, appear unanswerable as it stands; With what force must it be confirmed when we come, presently, to contemplate the Seventh and Eighth Propositions: which, among other data, state the rationale of Visual Figure as being constituted by the Interlimitation of our Sensations of Colors by each other? Can it, in such case, be imagined that England, or that France, will not before long revolt from the situation in which the doctrine of the Mind now alluded to has placed the intellectual character of the age; and, inevitably demand a re-union between Pneumatological and Optical Science, whose existing and unnatural divorce, from each other, form an exhibition of absurdity that cannot fail, of itself alone, to render the philosophical name of this era a proverb in the mouths of future generations?

In the mean time, as being of notable cogency in this place, I shall cite the Optical query of Newton, with regard to one point at least of Cerebral Vision.—"Is not vision" (says he) "performed chiefly by the vibrations of this medium, excited in the bottom of the eye by the "rays of light, and propagated through the solid, "pellucid, and uniform capillaments of the optic "nerves, into the place of sensation?"—And, having quoted this query, I confidently propose; Let those, who have in a later day treated it as chimerical, either declare that OPTICS ALSO, *together with that* AXIOM OF MENTAL PLACE AND POSITION WHICH ALONE SUPPORTS *Optics*, are chimerical: Or, if they will not do this; Let them, then, explain why no farther cast towards Cerebral Vision has been manifested by Philosophers, after the hint which Newton had afforded to them? The answer to this last question, I shall furnish in PROP. 7., from the writings of Dr. Reid himself, in adverting to his criticism of the notion of Briggs and of Newton concerning Cerebral Vision. The momentous truth, however, in this case is, that CEREBRAL VISION *and* THE REIDEIAN THEORY OF THE MIND ARE UTTERLY INCOMPATIBLE: *although* they are *not one jot more incompatible than the* REIDEIAN THEORY *and* OPTICAL SCIENCE. But, assuredly, Dr. Reid *did not discern* this utter incompatibility of his Theory with the laws of Optics. And, *if he had* discerned it, Optics was already built upon a rock, which he could not hope to assail. But (I repeat,) *he assuredly did not discern* this Optical dilemma, in which his Theory of the Mind has involved him. And, as Cerebral Vision had yet no citadel, or regular strong-hold, to withstand him; he thought that the battlements of his Theory might laugh, or frown, as they pleased, upon the solitary and unprosecuted conjecture of Newton. But, in the scrutiny now to be instituted, the Reideian Theory and Optical Science will be brought duly, and as they required to be, into comparison and collision: which, owing to the course of accidents, is a matter that has never before been brought to the consideration of the philosophical community: and, of which comparison and collision, the above objection, founded on the *certain necessity of setting out* in Optics with the admission of a LOCAL SEAT OF PERCIPIENCE, forms only the first fruit. And, if the Theory in question survive the issue; we shall certainly at least have cause of edification, one way or another. The merits of this case, however, will be farther discussed in the Seventh and Eighth Propositions, just alluded to. And it is impossible to lay too much stress upon its importance, not only to Optics, but also to the Philosophy of Mind.

### PROPOSITION 5.

*A primary, that is a proper visual image or that made up of sensations of colors, is manifestly about equal in magnitude to the tactual visual image on the retina which occasions it. And, by reason of the Bony Socket of the eye, which is situated immediately between the retinal image and the perceiving mind, it is impossible that the expanded image on the retina can be the ultimate and equally-expanded image in consequence of which the mind perceives a Visible Figure during that act.*

PROOF, &c.—Taking our stand upon the Optical Axiom asserted in the last proposition; it is manifest that the situation and nature of the Bony Socket of the eye precludes the possibility that any organ EXTERIOR to that Socket, whether it be supposed to be the *Retina* or the *Choroides,* or *both these acting together,* can be the immediate or ultimate organ of vision. And this fact, if it had been adverted to, *must* have driven inquirers to seek *within* the Cranium, for the ultimate organ in question. It seems curious that this objection—namely—of the DEGREE OF EXPANSION OR RELATIVE MAGNITUDE of a retinal image—should not have struck the disputants on this question; since it is, plainly, as easy for a camel to pass through the eye of a needle, as for the expanded retinal image to pass, *in all the magnitude of its own expansion,* along the *optic trunk.* It was in consequence of my having viewed, in accordance with this fact, what appeared to me as being a manifest analogy, of *size at least;* and, when duly considered, *not only of size, but also of situation and superficial arrangement;* between the capacity of the *Retina,* and that of the *Two Optic Beds considered as one organ;*—that I was led to afford it a farther consideration:—a mere hint concerning which, I expressed in my Manual of the Mind, without then prosecuting the matter farther.

At this moment, I consider the objection against the Eye itself, on account of the Barrier presented by the wall of the Cranium behind it, as being unanswerable. But all that I shall add with regard to it, here, is that, in case any person should suppose that a *tactual visual image reproduced within, and transmitted along the diameter of the optic trunk,* is a thing very little probable; he has only to reflect that the image of a whole landscape can enter the eye in a diameter less than that of a pin-hole. Nor is it at all necessary to suppose that a tactual visual image, while travelling along the optic trunk, *preserves the exact proportions or features of that on the retina,* any more than it must preserve the *magnitude* of a retinal image.

### PROPOSITION 6. NATURE OF LIGHT.

LIGHT *is an* EXTERNAL *substance, or medium: And this medium is* NEVER PERCEIVED.

PROOF.—Light, whatever else it is, in an *external* physical medium, or agent. IT IS NEVER PERCEIVED,—it not being an object of sight, but an object of our reason or understanding: Its *radiation, refraction,* or *reflection,* is never known to us but as a fact ENTIRELY HYPOTHETICAL; neither of these properties ever being *detected* by us in any of the *phenomena;* but these hypotheses rest wholly for their support upon *an agreement with perceived phenomena,* connected with the hypotheses by mathematical deductions.

But, although the *hypothetical* origin of the laws and of the existence of light is not for a moment to be denied; we shall not on that account hold their truth to be at all disputable. As long as the inventions of the Optician shall exist; and Astronomy, and Navigation, and the Arts, shall owe their perfection, if not their very existence, to the operation of these deduced laws; mankind must smile at the imputation of an hypothetical descent, when applied to facts thus supported. It remains only to suggest here that, we are LOGICALLY BOUND TO BE CONSISTENT, *in employing* SIMILAR HYPOTHESES, (*provided they admit of similar and equal proof,*) *when we come to inquire concerning* CEREBRAL VISION.

## PROPOSITION 7. NATURE OF COLOR.

COLOR *is a* SENSATION, *that is an occasional* MODIFICATION AND STATE OF THE MIND; *and is* NOT AN EXTERNAL THING.

The only reason for making a formal proposition, here, of a fact so universally acknowledged by philosophers, as that now asserted, is a regard to the mischief which, it will be shewn, has accrued from an occasional confounding of the conception of COLOR, with that of LIGHT, in the minds of optical inquirers. Previously, therefore, to shewing that such mischief *has* accrued, I shall here cite the doctrine of Sir Isaac Newton, when speaking as a *Natural Philosopher*, concerning color: which, also, is no other than the *Pneumatological* doctrine of Locke with regard to it. Under the express name of a "DEFINITION" of the subject; Newton, in his Optics, says—"The "homogenial light and rays which appear red, or "rather make objects appear so, I call rubrific or "red-making; and those which make objects ap- "pear yellow, green, &c., I call yellow-making, "green-making: and so on of the rest. And if at "times I speak of light and rays as coloured, or "endowed with colour, I would be understood to "speak not philosophically and properly, but

" grossly and according to the conceptions of " vulgar people. For the rays, to speak properly, " are not coloured. In them is nothing else than " a certain power and disposition to stir up a " sensation of this or that colour."

Such is the doctrine of color which, since the time of Locke, has known no dissent, except in the case of a small and harmless *nominal* divergence on the part of Dr. Reid; whose peculiar doctrine of the mind led him to argue that, *color is the name of the external quality which occasions* our Visual Sensations: while, on the other hand, he acknowledges that the " *sensation may be called the " appearance of color to the mind,*"—a confession which amounts to a fullness of consent with the otherwise universal agreement on the subject. When, therefore, we find Opticians, and Philosophers in general, affirming, as they almost universally do, that LIGHT *and* COLORS are the *objects of Sight*; and, continually talking of *colored rays*, and of "*pictures painted* on the retina;"—we must duly and always take note that, they are only speaking "grossly and according to the conceptions of vulgar people:" Which practice, manifestly, has arisen for the sake of convenience in the *saving of circumlocution;* especially, as no person has invented an appropriate and abbreviated phraseology of the subject, corresponding with Newton's device of employing the terms *red-making, yellow-making, &c.*

It is now requisite only to produce a remarkable and sufficient example of the fact, that Light and Colors HAVE, on very serious occasions, been confounded, not only in the phraseology, *but in the conception also,* of very eminent writers on the subject. The case, to which I shall advert, is that of Dr. Reid; who had read, and written, and doubtless thought, much on the visual properties of the eye, in his "*Inquiry into the Mind.*" And it is to *his* case that I alluded, in the close of the Fourth Proposition, on account of the importance to Philosophy of the consequences which it involves.

In the first place, it is proper to observe that Dr. Reid, in introducing some strictures upon Newton's query with regard to cerebral vision, affords a full share of praise to his *modesty,* as well as to his genius. For my own part, however, although I am nothing short in veneration for both the genius and the modesty of Newton, I never could make out a moral distinction, between his employing the word "QUERY" and if he had said *I think, or suppose:* While, certainly, either of these last mentioned terms amounts, virtually, to what would incur a *philosophical loss of cast* in the eyes of Dr. Reid, and from which sin he altogether absolves Newton—namely—an HYPOTHESIS. Dr. Reid, however, after stating the query in question, (which need not here be re-quoted,) remarks upon it as follows:—"I beg leave to distinguish this query into two, which are of two "very different natures; one being purely anatomical, the other relating to the carrying species "or pictures of visible objects to the *sensorium.*"

The distinction of questions, thus made by Dr. Reid, is a very just one. Let us see, therefore, in what manner he follows it out: while we also keep sight of the ridicule with which he had previously treated the conjecture of Dr. Briggs,—namely—that, in certain cases of vision, the *optic nerves "having the same length and tension,"—"will present one and the same image to the mind:"* although I do not at all mean it to follow that we are to embrace this hypothesis of Briggs.—In the course of much pleasantry on Briggs' conjecture, Dr. Reid says:—" Since, therefore, a " blind man may guess as well in the dark as one " that sees, I beg leave to offer another conjecture " touching the nervous system: which I hope," &c.—" Why may not the optic nerves be made " up of empty tubes opening their mouths wide " enough to receive the rays of light which form " the image upon the *retina,* and quietly con-" veying them safe, and in proper order, to the " very seat of the soul, until they flash in her " face," &c. &c. It is after indulging in this strain, with regard to Briggs' conception of the matter, that Dr. Reid, in examining the *second* member of Newton's query expresses himself as follows:—" Here it seems natural to put the pre-" vious question,—What reason have we to be-" lieve that pictures of objects are at all carried " into the *sensorium,* either by the optic nerves or " by any other nerves?"—" I confess this was my " own case for a considerable part of my life: " But since I was led by accident to think " seriously, what reason I had to believe it, I " could find none at all."—" I am not conscious " of any pictures of external objects in my

"*sensorium*, any more than in my stomach."
"INQUIRY, *chap.* 6. *Sect.* 19."

Here, *by the way*, I must remark; One of the wonderful things exhibited in this quotation is the fact that, Dr. Reid informs us, *in effect*, that he was CONSCIOUS that pictures of extended objects WERE in his sensorium, or rather in his MIND: which *case of belief, (for, to be sure, he does not at the moment* CALL *it consciousness) he imputes to* "EDUCATION;" and *supposes the same cause may have misled* NEWTON. Is it not wonderful that a man,—and that man a *Philosopher*,—should for a considerable part of his life,—*that is even until he had attained the age of forming philosophical opinions*,—have BELIEVED that the Sensations of Colors in his Mind were *extended and figured:* and yet, AFTERWARDS *come into court and declare them all to be nothing of the kind, for that* EDUCATION *had deceived him?*

EDUCATION, it is certain, can make us *prefer bitter to sweet:* but, education can never make us *believe that bitter is sweet.* And, if Dr. Reid was mistaken in believing, from his consciousness, for so many years, *with Locke and Newton and all mankind except Reideians*, that his Sensations of Colors are extended; it is deplorable; and, indeed, it is more than deplorable, because it is intolerable; that afterwards, upon believing the contrary, he should saddle EDUCATION with the false imputation of its previously deceiving him.

There is one great mistake, into which Education might certainly lead us, in this subject: It might, unless counteracted by due reflection, hide from us the momentous fact that, the pictured images which we perceive in the mind are *modifications or states of, the mind itself;* since it might make us believe that these pictures are *only "species," let in by the channels of the nerves, from external objects,* and that, at the nearest, they are *never more near than being* PRESENT TO, *instead of being* ACTUALLY IN, *or an* ACTUAL STATE OF, the mind. This, in fact, was the mistake of the earlier inquirers. And it has taken two thousand years to bring all Philosophers to an agreement which forms the modern and sure Starting-post of Pneumatological Science—namely—that the things formerly called *species, or ideas,* are in reality STATES OF THE MIND ITSELF, BEING ITS OWN SENSATIONS OR MODIFICATIONS. But the mistake of the Ancients, now adverted to, was altogether foreign to that which Dr. Reid confesses he had entertained on the subject for a considerable part of his life. Nor does he oppose Newton upon *this* ground: because, although both Newton and Locke gave in to the scholastic PHRASEOLOGY of *species,* and of their being *present to* the mind; it is quite certain that neither of them would for a moment *defend* this phraseology *as being strictly expressive of the fact;* for Newton, (as well as Locke,) in his Definition of Color above quoted, has completely purged himself of this fault. And certain it is that EDUCATION could never have made Dr. Reid, or any other man, *grow up to manhood* in any false belief with regard to the *superficial spread, or not spread,* of his sensations of colors. IS IT NOT *therefore wonderful* that the frank and repeated avowals of the Founder of Reideian Theory, in various parts of his writings, of his having come to his doctrine of the mind *in the very face of his own previous consciousness confided in up to his manhood,* should not have saved Europe from the predicament of having that doctrine at this moment in a state of growth and promulgation, through some of its most enlightened countries. The candour of Dr. Reid, to his praise be it recorded, is here above all ordinary value; since it completely redeems HIS mistake, by proving an infallible antidote to his Theory of Inextended Sensations, involving that of an Unlocal Mind: For it is impossible ever to separate these two things, as properties of mind: And, *either*, Optical Science which demands a local mind must be exploded as being a chimera; or, if not, the Reideian Theory of the mind is a reproach to the human understanding. But, to return to the case of Dr. Briggs and of Newton's conception. The principal, and the only important reason for citing the case of Dr. Reid, or his Strictures upon this subject, is *to show by what course* Philosophers, especially since Dr. Reid began to publish his pneumatological views, *have been deterred from casting at all in the direction of Cerebral Vision: And, still more importantly, to show how completely void were the strictures of Reid, of any foundation in philosophy.*

Dr. Reid brings the strictures in question to a close, in the following words:—"The conclusion "from all that hath been said, in no less than "seven sections, upon our seeing objects single

" with two eyes, is this; That, by an original pro-
" perty of human eyes, objects painted upon the
" centres of the two *retinæ*, or upon parts similarly
" situated with regard to the centres, appear in
" the same visible place; that the most plausible
" attempts to account for this property of the
" eyes have been unsuccessful; and therefore,
" that it must be a primary law of our consti-
" tution, the consequence of some more general
" law which is not yet discovered."

Now, as for this last mentioned conclusion; I beg leave to put in my confident dissent from its being true that the fact of single vision from a double impression is a primary, or, what he means, an *inexplicable* law of our nature; for the justification of which dissent, I shall trust to the sequel. But, what is here for our principal consideration is the expression, in the passage above quoted,—namely—that of "objects PAINTED upon the retina." And, first, the phrase—"objects"—(they are often called *pictures*) "*painted on the retina*,"—is as usual and as favorite an expression with Dr. Reid, writing *as a* PNEUMATOLOGIST, as it ever is with any other writer *as a mere* OPTICIAN. Now, therefore, the whole weight of ridicule, which Reid had playfully heaped upon the query of Newton, recoils upon himself with a force which no one can desire to be augmented; since it is *only upon the assumption, as an actual and literal fact, that the images on the retinæ* are "PAINTED" OR COLORED images, that it was possible for him to throw any ridicule upon the conjecture of "*carrying species of objects to the Sensorium*," along the trunks of the optic nerves. That a *tactual unpainted image, (which we know is the sort of image that is formed in the eye,)* should be transmitted, in a *contracted size,* along the optic nerves; and thereafter be *expanded in the brain to about its original size;* and that, consequently upon an impression of this tactual visual image, we should have a PAINTED image—*i. e. a* SET OF SENSATIONS OF COLORS—*in the mind;* is a supposition *so natural; (although it is altogether hypothetical and unproved in this place;* and is not even supposed by Newton to exist in *this modification;*) that nothing but ridicule can fall upon any attempt to ridicule it. At the same time, Dr. Reid, whenever he thought of it, knew as well as any man, and freely acknowledged, that images on the retina are *neither painted or colored, nor yet perceived by us.* Could it, then, be any other than a temporary oversight, or a momentary lapse altogether surprising, that could have tempted Dr. Reid to hold up the conjecture of Newton, or yet that of Briggs, to philosophical contempt? Each of the conjectures in question *might be, and indeed were, false in point of particularity.* But there is an infinite difference between missing a precisely true conjecture; and a *dealing in chimeras whose very* KIND *ought to be scouted from philosophy,* which last was, certainly, the procedure imputed by Reid to Briggs, and to Newton.

The fact in question is, by far, too important to Philosophy, to allow me to dismiss it without letting Dr. Reid speak for himself, beyond the possibility of any opening for cavil. In the 12th Sect. of the 6th chap. of his INQUIRY, page 252, 3, speaking on the subject, he says—" There is not " the least probability, that there is any picture " or image of the object either in the optic nerves " or brain. The pictures on the *retina* are formed " by the rays of light; and whether we suppose, " with some, that their impulse upon the *retina* " causes some vibration of the fibres of the optic " nerve; or, with others, that it gives motion to " some subtile fluid in the nerve, neither that vibra-" tion nor this motion can resemble the visible ob-" ject which is presented to the mind."—Now, in all this passage, (which goes farther than is here quoted,) Dr. Reid proceeds upon a wonderful *confounding* of the word *picture*, with the word *image;* and he manifestly forgets that an image on the retina is NOT A PICTURE OR PAINTED thing, but is *in its own nature a* MERE TACTUAL image, as if it had been pricked out by points of pins. Arguing continually on this, his mistake, he in the next page says:—" If any man will shew " how the mind perceives images in the brain, I " will undertake to shew how it may perceive " the most distinct objects; for if we give eyes " to the mind to perceive what is transacted at " home in its dark chamber, why may we not " make those eyes a little longer sighted?" Now, here, the phrase—" DARK CHAMBER"—presents us with a *climax* of absurdity; which must render any farther illustration of it out of the question. No man, who knows that the only visual things he perceives are his own *sensations of colors together with their interlimitations* (for the analytical proof or rationale of which, see the Eighth proposition,) can for a moment believe that the mind PERCEIVES ANY images in the nerves, or brain. But, nevertheless, every man must believe that the mind perceives its own visual modification *consequent upon some* TACTUAL *images* in the nerves and brain. And here it is lamentably manifest that Dr. Reid puts in, *as a bar to this supposition,* that the mind is in a "DARK CHAMBER;"—an objection which, indeed, would be cogent enough if an image in the nerve, or brain, were a PICTURE OR PAINTED image; but which presents an antidote to all serious thought when we recollect that the images, any where in THEIR PASSAGE SHORT OF THE MIND, must be ALL TACTUAL images, and therefore that "DARKNESS" can no more affect them, than light could if they had it.

In professing to exhibit, in this inquiry, a rationale of the Cerebral laws of Vision, I was manifestly under necessity to show that the reasonings which have been employed by Dr. Reid, to make any attempt at such a matter appear unphilosophical, were totally nugatory and such as recoil upon the genius of their Author. And, I trust, I have completely made out the case desired. At the same time, when we consider the growing influence of Dr. Reid's opinions, since the time they were first broached; it is pretty clearly accounted for why those inquirers, who have kept in the ordinary creed of their generation, have been scared from any thought of exploring a region of Cerebral Vision,—a region which has been marked out by Dr. Reid's School as being *philosophically worse than contemptible.*

But I must not conclude the topic, now in question, without farther evidence. The case of Dr. Reid, though it is singular in degree, is far from being singular in kind: for other eminent Writers have fallen into the same sort of oversight. Thus, Dr. Potterfield, in his endeavours to establish a chimerical assumption, (which will be disproved in its proper place,) that we SEE *external direction; and* see it *perpendicularly to the impressed points of the retina;* says that—" in seeing any object, the " mind, by virtue of a connate immutable law, " traces back its own sensations, from the senso- " rium, to the retina, and from thence outwards, " along right lines drawn perpendicularly from " every point of the retina." Now Dr. Potterfield, in other parts of the same Work, asserts as strongly as any Writer need do that our sensations are NOT *in the retina, and far less outwards from the retina.* Is it not then lamentable, that, in a moment of bias toward a chimerical principle, such a Writer should thus turn round in the face of his own asserted truth, and talk of " TRACING OUR SENSATIONS *backward to the retina, and to an external object?*"

Nor is this example all that might be adduced on the subject. No less a Writer than Dr. Smith in his Optics, in the very face of Newton's Principles, talks about what is " requisite to excite in our minds the Sensation of light:" which is a Sensation that is impossible for us to have. The same Writer, also, expresses himself as follows:— " Now, if it be asked why in seeing with both " eyes we do not always see double because of a

" double sensation ; I think it is a sufficient reason " to say that, in the ordinary use of our eyes, in " which the pictures are constantly painted upon " corresponding places of the retinas," &c.—And here I must beg leave to observe that, the phrase—" *double sensation*"—is nonsense : for the Writer *meant only a double tactual visual impression ; which thing is not in the mind.* And, no less, the phrase—" *pictures painted on the retinas*"—expresses a most mischievous optical misconception. Have we not then, here, a plenitude of proof, of the existence and mischief of that species of misconception which I affirm has stood in the way, to prevent a Science of Cerebral Vision? And, Can any thing more demand notice, and reform, than such a *continual exhibition of vacillation and inconsistency* in the most eminent Writers on Optics?

I shall conclude these reflections by observing that, it has altogether been put in proof, that the phraseology usually employed in Optics, and especially the phrase of—" PICTURES PAINTED *upon the retina,*" — *has some times seriously affected the* CONCEPTIONS of inquirers; as it most certainly has done in the cases above adduced. And, having stated so remarkable examples of this fact; I trust we shall never run a risk of being betrayed, by the same means, in the course of the following essay : *For, it is essential to a rationale of cerebral vision,* that we never should fall into this sort of deception.

In fine. I am far from supposing that the query of Newton *must necessarily* have led to any systematic attempt to erect a science of Cerebral

Vision, even if Dr. Reid had never criticised that query. Because, it is long known, *or believed,* that the Optic nerves do not cross *in mass,* as he supposed them to do. Nor does he, as I shall show hereafter, *at all recognise that Mode or General Case of Vision* upon which a Science of Cerebral Vision can be founded. And it will clearly appear, that my own direction to the subject arose from no thought of his query. But it is altogether beyond a question, that a large proportion of persons *may naturally* have been scared from the attempt by the *strictures of Dr. Reid* on that query. And, above all, setting those particular strictures apart, it is certain that the *Reideian doctrine of the Mind, as far as it has been received,* has presented a wall of adamant against any thought of Cerebral Vision: While, at the same time, the Reideians have overlooked, and have slept soundly upon the fact that, EITHER *the Dioptrical Law of Light, or the Reideian Theory,* MUST be to the last degree chimerical, since the LOCALITY *and* RELATIVE POSITION of a *perceiving mind* is a POSTULATE OR AXIOM NECESSARY TO THE VERY EXISTENCE OF THESE LAWS.

As the Laws of Light thus demand, for their existence, the Postulate of the Locality of every mind that perceives by light; It may be presumed, no Philosopher in future will place himself in the situation of *declaiming upon the* PHYSICAL SIMPLICITY *of the mind;* since the assumption of *simplicity,* in a mind that *has locality,* would be a position above all gravity in philosophy. At an epoch of general knowledge, therefore, at which very few readers can understand the merits of a pure Pneumatological discussion; but in which thousands are acquainted with the Principles of Optics, and with the cogency of the Laws of Light; the best means, perhaps, that ever could be employed to disenchant the age, from the growing spell of the Reideian doctrine, may be that of insisting upon its incompatibility with Optical Science.

I may be told, by those who duly apprehend the subject; and I am sufficiently aware of the fact; that *all the other* Sciences, and Arts, and all the ordinary affairs of life also, afford an *equally real* antidote against the doctrine in question, *provided only mankind be allowed to judge* of the subject "ON THE PRINCIPLES OF COMMON SENSE." But the superior efficacy, which I suppose resides in the antidote now insisted upon, *when it is applied to the minds of readers in general, is this:*—that *in no science, or business of life, except in* OPTICS, IS THE LOCALITY AND POSITION OF THE PERCIPIENT made a STRICT MATHEMATICAL OR RATIONATIVE POSTULATE, *without assuming which, as an essential part of the Science, that Science cannot exist, or even so much as put forth its first step. In Chemistry,* for example, any more than in dining, or drinking tea, it is *never formally stated as a postulate,* that a man's mind must be where his body is. And the Reideian theory laughs at those ordinary persons who labor under the "BIAS" of *tacitly* assuming this postulate.—That it does so laugh is certain: For, if Dr. Reid were alive, and were to affirm that, by an INEXTENDED mind, he does *not mean an* UNLOCAL mind; the Ghosts of all antiquity, and the Spirit of all sound Philosophy, would rise and join to resent the insult offered to their understanding; or else, at least, to wonder at the fatuity which a "BIAS" could work in the mind of a Philosopher. But, to do justice to Dr. Reid, he has not (*whatever his successors have done*) at all attempted to deny that inextension of mind, *and non-locality of mind,* are one same principle: because he continually designates the "*Sensorium*" in *italics,* in order to stamp it with ridicule.

By the renewed endeavour, as it certainly is, which I have here, standing upon the ground of Optical Science, made to convey to the eye of Europe the refutation of that doctrine which I have through the whole course of my pneumatological speculations earnestly and from strong conviction labored, I confess, to overthrow, as being in its certain tendency, though not in the intention of its founders, most pernicious to human happiness, because it is every way and palpably baseless in reality, and cannot but leave open one knows not how many roads to Scepticism, to Atheism, or to any other Chimera of men's imaginations; I feel confident, if this labor, like former ones, should remain for a time but partially influential, its full time, nevertheless, must come; and the result must be that of a re-union of Philosophers on the Lockeian ground above asserted. With this forecast of the event; I would put the following case to the reflection of those who think for futurity. At the moment I am now writing, an association of enlightened minds have advanced to the founding of Two Universities in the Metropolis of Britain; in one at least of which, (it is already made public,) there will be lectures on OPTICS, and lectures on MIND,—a new epoch in the literary character of the Country, and one which would seem to invite to a new system of procedure in the *advancement* of Science, no less than in the *diffusion of what is already known*. What a Spectacle will it not then present; if a cluster of warm and ductile Aspirants for knowledge, after having, in the Theatre of the Optical Professor, fixed and built themselves upon the Dioptrical Postulate that, when a *Radiant or Visible Object is on* ONE side of a lens, the *Perceiving Mind must be on the* OTHER! What a spectacle will it not present to posterity, if, upon the mere change of lecture-rooms, from the presence of the Optical, to that of the Pneumatological dispenser of their philosophical faith, these now unfledged learners, but future teachers of mankind, (unless they rebel in the last mentioned station) must *bow their knee to the doctrine that it is a philosophical abomination to suppose* MIND A THING LIABLE TO PLACE!

As one grown old in affording his unpaid labor to the subject; I may perhaps be permitted to lay claim to as large a share of a sense of *duty*, mixed in with the other usual ingredients in human motives, as can fairly be pleaded by most men. And, if this plea be judged to constitute a privilege; I would use this privilege, earnestly to entreat the attention of the founders and proprietors of our recent Universities, to observe, and to *calculate the* *consequence* of the event, if the spectacle I have above imagined should in reality present itself. It is far from my intention to have this construed into a *prediction that such a thing will* happen. But, no one will deny that such *has happened.* Nor will any competent judge deny the magnitude of the absurdity which it fixes upon the human understanding; or, the growing mischief which MUST follow, if the learned classes of the community should sanction an UTTER AND COLLEGIATE RECKLESSNESS OF ALL COMPATIBILITY AND CONSISTENCY BETWEEN THE SCIENCES.*

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* On the publication of the precursory Essay of the Pneumatological Professor in the University of London, I took it to myself, as matter of duty, to have an interview with that Gentleman; and found, he had already under his perusal such of my writings on the subject as are in the Library of that College. I feel bound to add that, although his Essay bears decided evidence of the influence of the Reideian School, he, in the course of touching upon some principal points, manifested an impartial and liberal disposition to embrace truth, on which ever side he should find it to be, according to his judgment, in his approach to the opening of his course. And I here intimate that I shall, immediately after its publication, send to his address a copy of this Rationale; in order that he may be in full time aware of my objections against the Reideian Theory on OPTICAL grounds.

I embrace this occasion to signify, that I shall also forward a copy of the Rationale to the Professor of *Natural Philosophy,* in the same University. And I cannot do less than calculate upon his concurrence and recognition of this work, if he be the Gentleman who, in the "LIBRARY OF USEFUL KNOWLEDGE," has supplied that Compendium of *Newton's Optics,* at the close of which he introduces, with such warm eulogium, the query of Newton, in which that great man virtually avows the

## PROP. 8. THE LAWS OF VISUAL FIGURE.

VISUAL FIGURE,—*otherwise called* VISIBLE,—*is the Mutual Interlimitation of our Sensations of Colors by each other, when more than one unvaried Sensation of Color is present in the mind.*

PROOF.—The Rationale of Visual Figure is comprised in the four following self-evident propositions.

FIRST LAW.—UNFORMATIVE :—When we have *only one uniform or unvaried* sensation, that is a Sensation of *any one full or unblending color*, in the mind; we then have no perception of *any figure, any line, or any sensible point.* And, besides this being a *fact perceived, i. e. a mere law of nature*, it is a self-evident *necessary truth, of the nature of a mathe-*

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belief that the INFINITE MIND has *Infinite Space for his* SENSORIUM; and that, our human minds have, each its own "*little Sensorium which receives the images of things.*"—The reputation of Dr. Lardner, as a man of science, must ensure the consistency of the result, as a matter due to himself, and of which I cannot doubt the issue. It comes not within my view to enter into solicitation for assents. But I consider it fit it should be named, that the assents of the more eminent persons in this department; (in which, Dr. Lardner, in his Professorial, as well as in his Literary capacity; and Dr. Brewster of Edinburgh, from his researches in Optical Phenomena; certainly stand conspicuous,) are rendered a matter which, if the withholding of it be not justifiable, the world will deem they are especially called upon to avow.

*matical axiom, that it is impossible any other result should happen.*—For an example of this law, we have only to contemplate an *unclouded sky*, on a fine day: in doing which, it is impossible we should, *from this datum or phenomenon*, have a perception of any figure, any line, or any sensible point.

SECOND LAW.—FORMATIVE:—When we have *any two sensations, of different full and unblending* colors, in the mind; they MUST MEET, and their *common line of meeting* is the thing we call a VISIBLE LINE. Thus, a VISIBLE LINE IS NOTHING BUT A CONTRAST *of two different Sensations of Colors*, perceived by a judgment or act of our understanding or intuitive faculty; WHICH faculty, during a sensation of blue and a sensation of yellow, judges that *blue is not yellow*, and that *yellow is not blue;* but that the CONTIGUITY AND CONTRAST, between this blue and this yellow, is a LINE OF DEMARCATION PERCEIVED BETWEEN these two sensations. An example of this law is had when we contemplate the sea and the sky together, when their different colors present a contrast: for the perception of this contrast is the *visible line we call the horizon*. The like phenomenon is perceived in the Sensations of colors which we have when we look at a chess board, as it appears chequered with *black* and with *white* squares.

THIRD LAW.—FORMATIVE:—When any one sensation, of full color, *surrounds or embraces* any other; the line of meeting and of contrast, which they must create, *returns into itself*, and thus creates the *Outline of some Figure,* such as that of a square, a circle, a triangle, or any other shape. This Third Law *is, manifestly, only a different case of the* Second. And we have an example of it in the sensation of *white,* embraced by a sensation of *blue,* which we experience when we look at the moon in the clear vault of the heaven.

Fourth Law.—Unformative : — When we have any two sensations of different colors in the mind ; if the color of either sensation *soften, so as to blend with the other gently,* and to leave *no possible perception of contrast between the two where they meet ;* it is impossible they should afford us any perception of any figure, any line, or any sensible point, even if their distant sides were of two opposite colors, or black and white. An example of this is had when we look at a piece of shot silk, or at the dawning of day, or at any other case of the *melting of two colors into each other.*

In the operation of these laws, we are to observe, a *sense of* black, *i. e.* a sense of the total absence of sensation of color, *if experienced at the same time that any sensation of color is present in the mind, is equivalent to a sensation of color.* And a Sensation of white, is equivalent to a sensation of one color.

These Laws of Visual Figure are stated here as *constituting a link,*—namely—the *final link*—in the chain of Cerebral Vision ; this final link being that which during an act of vision *exists in the mind itself,* and which, consequently, exists ulterior *to the last cerebral fact or tactual visual impression.* This mental link, therefore, is the *only* fact, of the whole visual chain, or process, that can be called Vision, *strictly speaking.* And it is manifestly in the highest degree indispensable that the rationale of Visual Figure be contemplated, and reasoned upon, in order for the possibility of either raising or understanding a Science of Cerebral Vision. As laws of Mind, these principles have been recognised, both virtually and expressly, in various quarters; and most conspicuously, though not formally, so by the late Professor Stewart. Indeed, it was manifest, from their first proposal, that any thought of *denying* their validity was out of the question. But, owing to the existing state of Pneumatological Science in these Countries, they have in effect remained a dead letter during the fifteen years which have elapsed since the first suggestion of them. The more general promulgation of them must depend upon their being recognised, (as the growing exigences of knowledge shall require,) as being links in the chain of *some other Science which appears to be more an object of general interest than that of Pneumatology; and the true principles of which, when set forth, happen to be generally understood. And both these circumstances, doubtless, exist together in the case of* Optical Science; insomuch, that a corresponding result may fairly be anticipated.

As these laws of Primary Vision present the remarkable case of a re-union, *or identity rather*, of the Subjects of Physical Science with those of Mathematical; it may be of considersble moment to render this fact generally understood,—a fact, indeed, which readers in general will be apt to apprehend but tardily, unless it be repeatedly called to their attention. On this account I observe that the *Mathematical* nature of these laws consists in the fact, that their *truth and necessity does not depend,* like those of the propositions of Geometry, upon *any precise relativeness of magnitude, proportion, or direction:* which relative proportions (though, as Dr. Barrow truly asserts, they certainly exist in external space,) can neither be truly marked out in a diagram, nor yet depicted in our imagination. But the Mathematical nature of the Laws of Vision depends SOLELY upon the NECESSITY OF THE MEETING of our Sensations of colors, when any two, or more sensations of various colors are present in the mind; and, upon the NECESSITY OF THE RESULT OF THAT MEETING, which RESULT IS A VISIBLE LINE. From this, therefore, it is self-evident that, while the *Diagrams* of geometry are *false,* and its Definitions are *mere hypotheses* whose realities we can never depict; our *Sensations of colors, on the contrary, are facts that* DO *exist depicted in our minds;* and it matters not how large, or how small, they are, or *what difference of shape* they take on, since it is *equally and eternally necessary that their* MEETINGS *are* VISIBLE LINES, *and are the only visible lines ever apprehended by the human mind.*

No objection can be laid against this exposition on the score of the *imperfection of sense, i. e.* on a plea that *sense cannot apprehend a mathematical or breadthless* line. For, if we employ any number of magnifying glasses, of successively augmenting powers, one after another, in perceiving a line between any two colors; all the results will be that we shall, at every augmentation of power, perceive a *breadthless line of a new or different shape* from all the former: because a line that appears *straight, or smooth,* to the naked eye, will appear rough or *serrated* when we employ a glass upon it; and so on. But the *constant result, in every one* of these experiments, must be a BREADTHLESS VISIBLE LINE, that is to say a MEETING between two sensations of color. And, if we could repeat, or alter this process, to infinity; the last result would be a MEETING, as in all the former cases.

The Mathematical nature of these Laws of Vision, moreover, is the more deserving of notice, since they open to us a very curious field of PHYSICAL REAL EFFICIENCY: Though this consideration is not an object of the present inquiry.

In fine.—As the laws of the Interlimitation of our Sensations of Colors, most certainly, and beyond all attempt at denial, (whatever may have been hoped from evasion,) place the whole scheme of the inextension of our sensations, and of the mind, out of the pale of philosophy; and show, by a strict rationale, that Mind is an Essence which occupies space; I may here, with peculiar force introduce the Optical creed of Newton, involving his creed of the nature of mind.—" Is " not," says he, " the sensory of animals that place " to which the sensitive substance is present, and " into which the sensible species of things are " carried through the nerves and brain, that there " they may be perceived by their immediate pre- " sence to that substance? And these things be- " ing rightly despatched, does it not appear from "phenomena, that there is a Being incorporeal, "living, intelligent, omnipresent, who in infinite "space, as it were in his sensory, sees the things "themselves, intimately and thoroughly perceives "them, and comprehends them wholly by their "immediate presence to himself."—And here, if we except the word—"*species,*"—which, I have shown, Newton employed only in compliance with the scholastic phraseology of his day; the Creed, which he has avowed, is completely in accordance with the principles of mind which I have proposed and urged throughout my pneumatological writings. And I attach the more value to this coincidence from the reflection that, I had not therein the least thought of squaring my speculations to the opinions of Newton, more than to those of any lesser philosopher.

With regard to the *history,* as well as to the nature and merits, of the doctrine of the inextension of our sensations; which doctrine, the late Professor Stewart has owned, owed its origin to a half-blind or random guess of Dr. Hutcheson; as I have bestowed much and repeated study upon this part of our constitution, I have put the last hand of scrutiny, and of objection, to it in my Manual of the Mind: The particulars of which I would certainly wish to be perused with attention, by all those who are seriously interested in the Philosophy of Mind; because I cannot doubt the result, in any unprejudiced mind that is competent to apprehend the nature of the subject. In that work, which is so properly a companion to the present one that I intend, in the case of future impressions, the two shall not be separated; I have admitted the truth of the conception hit upon by Dr. Hutcheson, as being that of a *certain modification of our idea of extension;* and I have therein stated the *rationale* of that modification of the idea: whereas, Professor Stewart admits that Dr. Hutcheson's conception,—namely—*that our idea of extension* "is a *notion accompanying* sensations of "sight and touch, *rather than a mere sensation of* "*either of these senses,*"—was a mere incipient light; insomuch that, Mr. Stewart says of Hutcheson,— "*nor does it appear that he was at all aware of* "*the importance of the criticism on which he had* "*stumbled.*" And here I put, for the most earnest attention of philosophical readers, the remark which Professor Stewart makes, immediately after ascribing this blindness to Hutcheson.—"The "fact," (says Mr. Stewart) "as I shall have occa- "sion to shew in another Essay, is he had antici- "pated the very instances which were afterwards "appealed to by Reid, as furnishing an *experi-* "*mentum crucis* in support of his own reasonings "against the ideal theory."

"PHIL. ESSAYS, *Es.* 1. *chap.* 3."

Now I have in my Manual, in a very particular manner, shown that the Scheme of Reid found its cradle in a most egregious misconception of his, with regard to the meaning of Cheselden; who had asserted, with strict truth, that the eyes of persons laboring under a cataract enable them to *perceive color, without perceiving the figures* OF EXTERNAL OBJECTS: Which fact, Dr. Reid, in the then state of his mind, interpreted to mean that any such person can perceive color, *without perceiving it to be* SHAPED OR EXTENDED AT ALL,—*an interpretation in the very face of Cheselden's meaning;* who relates that, *on first receiving sight,* his patient *saw all colored objects as things touching his eye.* And here as it is plainly, and beyond all doubt, in evidence that, *besides this erroneous misconception of Cheselden's meaning,* the ONLY OTHER argument which Dr. Reid had to appeal to, "as an *experi-*" "*mentum crucis* in support of his own reasonings "against the Ideal Theory," was the fact which Dr. Hutcheson had "*stumbled upon;*" AND, *as the real nature of this fact is, certainly, of the last moment to the cause of Philosophy;* I shall now transcribe a passage, from what I have said in the Manual with regard to it: which, I repeat, I suppose to amount to a *rationale;* because the modification of the idea of extension, now in question, is a *notion of our judgment* and *admits* of a rationale. I cannot refrain from adding that, there is hardly any step of analysis, in the whole philosophy of the mind, that I would more strongly commend to the serious and strict scrutiny of readers than this one, on account of the *consequences* which in part may depend upon it.

"To proceed now, therefore, to consider the "Subject of Extension under a *more advanced* "*aspect,* as has already just been hinted, I alto- "gether agree that there is a *certain and a very* "*frequent modification* of the Idea of Extension, "in which the Idea of Extension IS INDEED '*a* "*notion accompanying* Sensations of Sight, and "Touch, *rather than a mere sensation of either of* "*these senses*,'—namely,—it is certain that *every* "*perception, or idea, of extension that exceeds the* "*magnitude of a sensible point,* either of Color or of "Touch, is an idea NOT ENTIRELY *of Sense or* "*mere Consciousness,* but is an idea or notion of the "*Understanding;* it being formed by our *discernment or judgment of the* CO-EXISTENCE OF MANY, "OR SEVERAL, sensible points of Color, or of "Touch, on the mind at any one time. This fact I "have duly adverted to in my First Lines, as being "preparatory to my treating the process of the "perception of Figure or Outline: In which place "I suggested that, *any ordinary-sized* patch of color "is not, as is generally supposed, A sensation,—"that is *not a simple or single* sensation or object "of *mere consciousness;*—but it is *an assemblage of* "*many elementary sensations,—i. e. of many sensible* "*points of color,*—CO-EXISTING LOCALLY SIDE BY "SIDE ONE ANOTHER IN THE MIND; *and is dis*-"*cerned by our Judgment as such.*"

In continuation of the same argument, I have urged that, *every single sensible part or element* of Sensation of Color is an *extended surface;* and, consequently, that *Sensations* of color, and therefore our *sensible ideas* of color, are extended things. While it was also insisted that, our *notion or judgment of the co-existence of several* of these extended points of sensation of color, in the mind, *is so far from being a contradiction,* that *it is an* ANALYTICAL PROOF AND CONFIRMATION of the fact that Mind and its Ideas of sensation are extended things.

Having supplied thus much of explanation, concerning the history of our idea of Extension; I feel urged by the strongest conviction to put the following questions:—Will it be believed in after times, when the Reideian Theory shall be named in history as one which trod immediately upon the heel of the Newtonian age; and which, during a century of what may be called the literary, if not the philosophical estimation of the period, *dimmed the lustre of the genius of Newton, together with that of Locke;* that this Theory had NO OTHER ORIGIN, OR FOUNDATION, than the illusion of Reid with regard to the fact related by Cheselden, together with that vague conception of the idea of extension which (in the words of Professor Stewart) Dr. Hutcheson had "*stumbled upon?*" And will it be believed that, THESE TWO SUPPORTS FORM THE SOLE EVIDENCE, AND AUTHORITY, upon which the Philosophers of the Reideian School have calmly, and continually, reiterated, as if it soared above all denial, or question, the assumption that *it is a "bias" in mankind to conceive blue and yellow as things spread out or extended?*

## PROPOSITION 9. OF METHOD.

*There is logically indicated a* STRICT ANALOGY OF REASONING, *which* MUST *be employed in the Propositions that concern Cerebral Vision; precisely corresponding with the reasonings employed concerning the Laws of Light in Dioptrics.*

It being settled, by the rationale of Visual Figure, that SENSATIONS OF COLORS, *including their* MUTUAL INTERLIMITATIONS BY EACH OTHER, form the

SOLE DATA, OR PHENOMENA, from whence we are to reason in any department of Primary or Proper Visual Perception; it becomes self-evident that the two fields of Visual research, now in question—namely—the LUCERNAL and the CEREBRAL—are precisely analogous, and upon a footing as objects of our investigation. In other words; As we never perceive light at any time, (either its reflection, its refraction, or its radiation;): But, on the contrary, without any perception thereof, we have erected a rationative Science of light called the Laws of Dioptrics, the *sole physical datum or foundation of which is* SENSATION AND INTERLIMITATION OF COLOR; So, on the other hand, we are equally bound to employ this sole datum of physical fact—namely—SENSATION AND INTERLIMITATION OF COLOR,—from which to reason, and thereon to raise a rationative science of Cerebral Vision; the deductions of which *must, in this case, possess the very same cogency* as those of Dioptrics.

It is manifestly intended to be conceded here that, if any Propositions should occur, either in this or in any other treatise of the subject, *the proofs of which shall not be legitimately deduced from the data;* or, that the data themselves could be disputed as facts; in so far, the reasonings in question would be vitiated as *rationative* propositions, that is they could not stand upon the *same* footing as the acknowledged reasonings on light in Dioptrics. Any such Proposition, therefore; (and some such will of course occur, if we enter the regions of Anatomical inquiry; or appeal to its light on the subject;) will have to stand upon their own distinct foundation. But, as far as no deviation of this nature arises ; it is altogether beyond dispute that, ONE SOLE DATUM—namely—*Sensation of Color*—stands in the *very same degree of logical affinity* to the already-recognised Visual Mechanism of Light, and to the yet-unrecognised Visual Mechanism of the Nerves and Brain : Each of which systems of mechanism is equally unperceived ; and each equally and certainly known to perform *some* part in the physical concatenation of Vision.

Confiding in this estimate of the subject, as being one which, I think, cannot possibly fail, or be obnoxious to any possible objection ; I shall proceed, in the following Sections, to reason on the phenomena, in the prosecution of a rationale of Cerebral Vision, agreeably with the method laid down.

# SECTION SECOND.

## OF SINGLE VISION FROM TWO OCULAR IMPRESSIONS.

### INTRODUCTORY STATEMENT.

The several Modes or General Cases, into which Ordinary Vision divides itself, appear to be FOUR. And they may be enumerated as follows.

1. We may see an object *double* when there is an impression of light, from it, on the uncorresponding points of each eye.

2. We may see an object *single* when there is an impression of light, from it, on the uncorresponding points of each eye.

3. We may see an object *single* when there is an impression of light, from it, on the corresponding points of each eye.

4. And, lastly, We may see an object *single* when there is an impression of light, from it, one half, or part, of which is on one eye, and the other half, or part, of it on the other.

The Three first mentioned of these cases are generally known; and, to a certain extent, understood. The *First* case happens when the affected points of the retina, or ocular organ in each eye, are equally sensitive; and when, together with this condition, the attention of the mind is equally given to the visual impression in each eye: for, in this case, if an object impress the uncorresponding points of each retina, we always see it double. The *Second* happens when, either the affected points of the organ of the one eye, are less sensitive than the respective points of the other eye, or the attention of the mind is given more to one impression than to the other. This Second Mode or Case of Vision is one of the most ordinary that we ever experience: although no persons, except Philosophers, are aware of the fact.—The *Third* case happens when an impression of light, from an external object, upon each eye, falls on the corresponding points of each; and when, together with this condition, two other conditions co-exist,—namely—that the affected points in each eye are equally sensitive, and that they are equally attended to by the mind.

Allusions to each of these Three Modes of Vision will occur incidentally, as we proceed. Though it may be mentioned, here, that the enumerated causes and results of these modes may be variously compounded, or modified, in a number of ways, and degrees; which require the attention and recollection of an experimenter. But, the THIRD Mode, although it is *known to a certain extent*, appears to involve Visual *consequences* which have not been adverted to, or discussed, in any of the extant Treatises on Optics; and which it is one of the principal objects of this inquiry to investigate: Which consideration, therefore, will form the subject of the present Section.

In this place it may be observed, as a general remark or caution, to those who may require it in order to prevent their being led into any mistake, that, in the experiments which may be employed in the subject, especially those which afford examples of the fact of Single Vision from Two Ocular Impressions, it demands not only objects that are *vivid,* and *equally vivid;* and eyes that are *nearly equal* in their sensitive conditions; but, together with these, a considerable *intension of the mind;* to enable us to perceive or discern the phenomena accurately, or sufficiently: And the perceptions, or discernments, in question will, at the best, be *only occasional;* with frequent failures of one, or more, of the conditions required. It is owing to the operation and modification of these facts, that the phenomena of single and double vision cannot fail to puzzle, or embarrass, the judgment of ordinary observers; so as, in a great degree, to veil from them the real nature of the subject. But any caution with regard to them must be unnecessary to those who are practised in carefully observing the phenomena.

It may also be noticed here, although it was implied in the beginning, that the Four Modes of vision enumerated above, as being all those into which *Ordinary* Vision divides itself, are *exclusive* of any Mode, or Case, that happens in result of *extraordinary* causes, either in the structure or situation of the eyes, the nerves, or the brain, of a spectator: Although extraordinary vision will be resorted and appealed to, in the sequel, as affording the most conclusive and beautiful confirmations of the Principles deduced from the Ordinary Modes. Thus, it is an extraordinary case of v[illegible] when, by employing two tubes as a binocular, and putting a cap upon the farther end of each tube, we can *force* the object that is depicted upon one of these caps, into the same perceived field as that depicted on the other; and, by these means, can make two real external objects be seen as one same object. And the possibility, and easy practicability, of this device, and of modifying it in various ways, is a most valuable fact, in furnishing us with crucial experiments on the subject. There are yet other cases, and results, of extraordinary vision; which will be considered in their proper place, and which are of the last importance in the investigation of the laws of cerebral vision.

It remains to state that, what I have here enumerated as being the FOURTH MODE OF VISION, appears to be a clear field of unoccupied ground; there not being the least evidence of its having ever been noticed, and far less discussed, in any extant Treatise on Optics that has fallen in my way. On the contrary; the total neglect or oversight of this Mode; *or, rather, the avowed denial of it in the case of human vision;* is plainly implied, in a variety of ways, in the extant Treatises on the subject. With regard to the *reality* of this Mode, however, I do not anticipate the smallest possibility of an objection when it comes to be fully described in its proper place. And, as it will form, by far, the most important subject entertained in this inquiry; I shall devote the THIRD SECTION to the investigation of it.

These preliminary considerations being adverted to; I proceed, in the present Section, to consider the Visual Phenomena of the THIRD MODE.

## PROP. 10. THE FUNDAMENTAL POSTULATE OF OPTICS.

*It being the certain result of the rationale of Visual Figure, laid down in the Eighth Proposition, that the only elements or phenomena therein are* SENSATIONS OF COLORS IN THE PERCEIVING MIND, *forming between themselves the local limitations called Visible Figures; it follows that any Tactual Visual impression occasioned by any external object, whether it be of light, or of any other medium, which precedes and thereby occasions vision, must be* SITUATED SOMEWHERE LOCALLY BETWEEN *the external object and the perceiving mind.*

This proposition, being a self-evident mathematical truth or axiom, requires, and admits, of no proof from reasoning: And its consequences have already been insisted upon, in the Eighth Proposition. Therefore, it is only formally laid down here, as being the Fundamental Postulate of Optics, and the Position without which this Science must be utterly impossible. It is a position which can never for a moment be lost sight of, or violated, in the whole course of optical investigation. At the same time, there is one remark with regard to it, which is of material importance to be suggested here—namely—that, although this Postulate is manifestly, and of necessity, assumed *tacitly* in every stage, and every speculation in Optics;

*yet, the want of its being* FORMALLY *laid down,* and thus made a DULY-PROMINENT consideration, has doubtless been a great assisting cause of men's never having discerned the logical fitness, and existence, of a system of *Cerebral Vision.* The fact is that, this Postulate has hitherto been treated by Natural Philosophers, as some Pneumatologists have treated certain original laws or faculties of the mind; whose existence is of necessity *implied* in all the subsequent principles which are admitted and reasoned upon; but, to which they afford *no formal* recognition, nor pay to them any express attention: the consequence of which has been a frequent overlooking, and not seldom a mischievous violation, of some of the most important truths in philosophy. As a most striking example of the consequence of not having always made a formal recognition of the Optical Axiom, now in question; I have, in the Seventh and Eighth Propositions, sufficiently shown that its due statement and estimation would, of itself alone, have rendered the Scheme of *Mental Non-relation to Place* an object of the last degree of rational dissent. And here, with regard to Optical Science, I may observe that, the recognition of this Postulate is necessary, alike, to the maintaining of the laws of Lucernal, and to the raising of a Science of Cerebral Vision.

### PROPOSITION 11.

*By parity of reasoning from the Dioptrical Laws of Light, and proceeding upon the Postulate of the*

*Tenth Proposition; it is demonstrably* IMPOSSIBLE *that the* UNION OR COINCIDENCE *of any two ocular impressions, one in each eye, occasioned by light from an external object,* CAN BE ANY WHERE ON THE ANTERIOR *side of the Cranium; and, consequently, it is impossible that any external object, seen by means of these impressions, can be seen any where in the common axis of the eyes on their* ANTERIOR *side: But any object, seen from two such ocular impressions, must be seen somewhere in, or near, the common axis produced* BACKWARD INTO THE CRANIUM:—*And since it is certain, nevertheless, that we do invariably, upon investigation by the Touch, find any such object to be in the common axis produced* FORWARD; *and do* ALWAYS CALCULATE UPON *its being so situated; it follows that such calculation, when consolidated into a conclusion, is* PURELY A JUDGMENT OF THE UNDERSTANDING *by habit rendered instantaneous, as will be explained in a future proposition;* AND IS NOT AN ACT OF VISION.

PROOF.—If we apply, as we are under a logical necessity to do, the mathematical reasonings which have founded and established the laws of light, (*the subject itself of which laws we never perceive;*) to the action of the retina, optic nerves, and brain, (*which subject or action we equally, but no more than equally, never perceive;*) it is a self-evident absurdity to suppose a confounded image, arising from the union of an impression on each eye, to be any where on the *anterior* side of the eyes;—since no *rationated argument can be assigned why* the ocular impressions should converge, or unite, *before* the eyes.—Thus, in Dioptrics, we conclude, on the *sole authority of certain Visual Sensations,* and of a *change* of these sensations, (that is to say, for example, on the sole evidence of a change from a *uniform sensation of solar white,* to a *company of varied sensations which we call the seven primary colors,)* that a known external optical instrument called a prism, which we have employed for the purpose, has mechanically occasioned certain component parts, of a certain assumed, *but unperceived* thing called light, to divide themselves, by a process of refraction and divergence, so as to form seven distinct and extended superficial impressions *in separate parts of space on a wall.* And *since, on the authority of the same laws of light,* there are, in the case of two-eyed vision, *two considerably-separated impressions of light in our eyes,* that is to say, one in each separate eye; which impressions, therefore, in point of *correlative locality to each other, are precisely on a footing with any two separate impressions of light on a wall in what is called a Spectrum of the sun* occasioned by means of a prism; we are, most surely, equally bound to conclude that a known internal optical instrument called nerves, or brain, must possess an office of CONVERGING *certain rays, or lines, of some unperceived thing,* until these rays or lines become *co-incident,* and so form one same impression or tactual visual image, in some part of the brain, POSTERIOR TO THE EYES, on the interior side of the cranium.

If, as it is certainly true, the last mentioned of these two conclusions deserves no better name than that of an HYPOTHESIS; then, most certainly, the first mentioned also—namely—the Dioptrical Law of Light—equally deserves no better name than that of an hypothesis. And I may presume that, no hypothesis need be ashamed, that is found in company, and accurately of the same class, with those of the decomposition and recomposition of light.

The Proposition, now had in proof, explains on a strict rationative principle the mistake of those writers who have assumed that, in the case of two-eyed vision, we see the external object *in the direction of the common axis of both eyes.* This assumption, indeed, if it were true, would be *no explanation* of the fact: it would be only an *assertion* of it. But that, the assertion of the fact itself is a manifest mathematical absurdity, if we proceed upon the assumption of the laws of light, is self-evident: because, whatever is seen *before* each eye, must be seen *through* each eye *as through two collateral telescopes whose fields are separated in space;* and, in the case of two-eyed vision, it is self-evident that *each eye in some degree contradicts* the assertion of the other; insomuch that, though it is true that the object is CONSIDERED to be in *some place in front,* and in a *direction between* both eyes, this is ONLY A CONCLUSION OF THE MIND, and is *not at all an ocular phenomenon,* for, as to *Mere Vision,* we certainly SEE things *directly before* EITHER EYE, and *never before our* NOSE.

But the whole mistake is cleared up the moment we recognise that, according to the Proposition above demonstrated, two corresponding companies of rays, or lines of something, from any two ocular impressions, *must converge;* and *at last* MEET *and* BECOME CO-INCIDENT in some part of the cerebral mass situate in the POSTERIOR POLE of the *common axis,*—that is in the pole of the common axis *when this axis is produced* BACKWARD *into the cranium.*

## PROPOSITION 12.

*It being a settled fact that, the only constituent element (beside that of sensation of color in its varieties,) in* SINGLENESS OF VISUAL OBJECT, *is* SINGLENESS OF VISUAL SITE *of sensation of color; it is thereby farther manifested to be impossible that any two* CO-INCIDENT *visual impressions, which occasion in us the perception of a single object when we see it with both eyes, can be any where* ANTERIOR TO THE TWO SEPARATE *impressions in our eyes which, by their co-operation, somehow occasion the single vision.*

It being a self-evident and acknowledged Principle in Optics, that our whole field of vision is a portion of a Concave Sphere, of which the eye, or retina, is the centre; it becomes an axiom that the only element, which constitutes AN OBJECT, consists in the POINT, *or* POINTS, of VISUAL SITE, of any sensation, or sensations, of color; and this axiom must hold, with mathematical precision, from the whole extent of the possible field of vision, down to a mere sensible point of color; in all which extent, VISUAL SITE of sensation of color, (in its local correlativeness to the site, or sites, of other co-existing sensations of colors,) is the SOLE MARK OR CHARACTER which constitutes A VISIBLE OBJECT. This, therefore, being an axiom, admits of no reasoning to prove its truth. But the following observations, to which it gives rise, are very material in the way of illustrating its *consequences*.

The Principle, now adverted to, is recognised in a way, by Writers on the subject: but it is *so* recognised, as to amount to a very serious fallacy in the accredited doctrine concerning it; insomuch, that the refutation of that fallacy will form a considerable feature in a future Section of this inquiry. Of the truth of this remark, I can at present hardly adduce a more fit example, than by quoting a neat and recent little Treatise on Optics, which has been furnished in the popular work entitled the "LIBRARY OF USEFUL KNOWLEDGE;" and which, of course, contains the latest accredited doctrine of the subject: In doing which, I desire it may be understood, I do not at all impute the error in question to the Writer of that Treatise; who, in a Work of that kind, had only to embody Principles that happened to be in agreement with the knowledge of other Writers of the day. In the Treatise, now alluded to, it is said:—"The "subject of Single Vision with two eyes has "excited much needless discussion, as it is the "necessary consequence of the law of visible direc"tion."—"Because the lines of visible direction "from similar points of one image meet the lines "of direction from similar points of the other "image, each pair of similar points must be seen "as one point, and the aperture seen by one eye "will exactly correspond with the aperture seen "by the other eye."

Now, with regard to the first of these two passages; it is the mere assertion of a fact; which also, as a fact, will be in the fullest manner disproved farther on, by showing that *visible direction* is a mere chimerical principle, and by demonstrating that the very different Principle of VISUAL SITE must be adopted in its stead. And, even supposing visible direction to be a true principle, it *does not in the least* EXPLAIN WHY TWO SEPARATE impressions in the eyes afford SINGLENESS of visible DIRECTION. And, as for the explanation contained in the second passage; it is first to be observed that, nothing is more manifest than that it *would* be mathematically true and precise *were it only therein asserted, as a self-evident necessary truth,* that *rays of something must be produced, and must converge, from* the two separate impressions, one in each eye; and, at length, MUST CROSS AND BECOME CO-INCIDENT *at some spot* POSTERIOR to the eyes: While, upon the other hand, nothing is more manifest than the mathematical absurdity of supposing that we perceive owing to the fact that "lines of visible direction from similar points of "the one image, meet lines of visible direction "from similar points of the other image;" *since it is impossible we should perceive the meeting of any lines* AT ANY SPOT ANTERIOR *to the eyes,* because it is a certain and an acknowledged fact that we NEVER PERCEIVE ANY EXTERNAL OBJECT ITSELF, but perceive it *only through the* INTERVENTION of the impression, or impressions, in one, or in both eyes; and it is another certain fact that *lines of visible direction, when considered as such, are nothing but figments:* they are real things, indeed, considered *as rays of light;* but, *as we never perceive rays of light,* we *never can perceive* them as *lines of direction.* It will be shown, I trust most satisfactorily, in its proper place, that the man of mere nature labors not under a more profound deception in thinking that he SEES any *External Object,* than Philosophers do in thinking they SEE *External direction;* since, by applying the laws of light to the cerebral process, it will be demonstrated that a Being, endowed with Sight, steers towards an external object by the Eye, as the Mariner steers by his Compass. The thing here asserted against the seeing of External Direction is indeed already shown to be proved, in the brief Introduction to this work: because it was there asserted, from the reasoning of Berkeley and the surgery of Cheselden, that we NEVER SEE OUTNESS; which is only another way of saying we never see External Direction. But I shall, in its proper place, prove the same in a very different way, by proving the existence of a Principle of Vision which will be there suggested under the name of the Visual Principle of Co-incident Images; which, I propose to show, must be substituted for the supposed Visual Principle of External Direction.

The present Section may be allowed to end here: Because, although several other Propositions might have been added to the foregoing;

and several were in fact at first inserted in this Section; they have been purposely transposed to a future Division of the Work, where they will come in with much more effect. Additional arguments, indeed, might have been brought into the present Proposition: But I conceive they will be rendered altogether unnecessary, by the consideration of what will appear in the respective Sections that are to follow.

# SECTION THIRD.

## OF ERECT VISION WITH TWO EYES.

### INVOLVING THE CROSSING AND REFORMING OF IMAGES BEHIND BOTH EYES.

### *Introduction.*

The Three Modes of Vision already considered, are the only ones that have been recognised by Optical Writers as being comprised within the structure and capacity of the human frame. There is, indeed, another and very different Mode mentioned by writers, as belonging to many species of two-eyed animals: but this Mode is usually spoken of as *contradistinguished* from all those by which a human being, or any animal whose eyes are placed like those of a human being—namely—in the front of the head, can ever see objects.

As my own manner of Vision, however, very remarkably contradicts that view of the subject which excludes the *Fourth Mode* of Vision from being an endowment of the human species. And as, in consequence of attending to this Mode, I have been led to observe phenomena which demonstrably ought not to exist if the accredited doctrine of Erect Vision were true; I shall here, in the first place, describe the Mode in question, as being preparatory to the reasonings and deductions to be drawn from it.

1.—When we are in any spot, contemplating a landscape; or, are walking in the street, and beholding the houses on each side of us; or, are sitting in a room, and gazing on the walls and pictures around it; if, then, we interpose a Septum of Paper, or any other large sheet of thin substance between the eyes, and hold it perpendicularly between the face and the middle of our field of view; we shall instantly, and without the least effort, but on the contrary as a matter of *unavoidable necessity*, perceive one half of the field of visual objects with one eye, and the other half with the other; and we shall be satisfied that we *usually* saw in the same manner, before the septum was interposed.

2.—Yet, the fact above described is not the most complete, although it is vastly the most *usual*, fact of this Mode of Vision: For, when I said—"*one-half* of the field,"—a deduction remained to be made for a small part in the middle of it; which part *may* be seen by *both eyes;* but which, indeed, *very rarely* is seen by both, the impression from it upon one, or upon the other eye, being very usually, either from inattention or from causes in the eye itself, neglected. In order therefore to exhibit this Fourth Mode in the most perfect sort of example; if we place ourselves at the distance of a foot, or more, in front of a large picture, or map; and then employ a visual septum of paste-board fitted close to the face, with its farther edge in contact with the picture, or map; we shall, in this case, *most accurately see* ONE-HALF *of the map* with *one eye,* and the OTHER HALF with the *other;* and the two perceived halves will be *naturally,* as well as *accurately,* joined at their nearest edges, and so will form *One whole picture, or map.*

3.—What farther remarkably distinguishes this Fourth Mode of Vision, from every one of the Three preceding ones described, is that whereas, when we intentionally see an object double, from its making an impression on the corresponding points of each eye, it requires both a straining of the eyes and a lapse of time to effect our purpose. Thus, my own eyes being unequal in their effectiveness; if I hold up the blade of a pen-knife, or look through an opera-glass at an actor on the stage; in either of these cases I shall see the object in two places; but in the first case it takes a very considerable, and, in the last, a less considerable time, before I can gain sight of the duplicate object; and in each case there is a straining of the eyes, the former case requiring a greater strain than the latter. But in any of the cases of the Fourth Mode of Vision, now described, if we interpose a visual septum; (and the *mere hand itself* is fit, and is always ready to serve tolerably well for the purpose;) the *moment we do so,* the two halves of our whole field of vision stand revealed, one half to each of our eyes, and this not only without any effort, but in spite of our power to prevent it. This Fourth Mode, therefore, it is plain, is NATURAL ORDINARY VISION—NATURAL ORDINARY HUMAN VISION:—It is, in fact, *indisputably the most ordinary* of any mode of vision ever experienced by any human being endowed with two effective eyes: In other words, and to speak more definitely; it is the ONLY *mode of human vision with two eyes, in the case of* ALL OBJECTS WHICH SUBTEND A LARGE VISUAL ANGLE, such as a landscape, a street seen by a passenger through it, or any scene which occupies any large portion of our visual hemisphere, at any moment of time.

4.—That as often as we open our eyes upon a scene around us, we *must* see in this Fourth Mode, even without employing *any artificial* septum to make us do so, is quite certain: because the *Nose itself,* although it projects but a very little way beyond the eyes, is a *natural, and a continual, and an indispensable septum,* which can never be unemployed; and, by reason of its interposition, each eye can embrace only about 135 degrees of our horizontal visual circle; whereas, the two eyes together can embrace about 180 degrees or one half of a horizontal visual circle; and, hence, there must be at least 45 degrees of every horizontal visual semicircle which must be seen by one single eye, at the same time that the remaining 135 degrees of the same circle are seen by the other. But the actual fact, in any such case, is that, of the whole portion of any visual field which impresses both eyes, we *never, unless in some very extraordinury cases,* perceive *any part with both eyes;* the impression upon one, or the other eye, being, from a want of some one, or more, of the known requisite conditions, *not felt or attended to.* And thus is the General Fact of our usually perceiving objects, or scenery, one half with one eye, and the other half with the other, described and shown from experiments so familiar and conclusive, as can leave no fear of its reality being ever disputed.

Here I must not at all be considered as assuming that the suggestion of this Mode, in itself, is any *discovery;* or, that I have been the first to observe a general fact of vision which in reality is extremely obvious to the notice of all mankind. If it be, as indeed it would rather appear, a discovery to Philosophers; I can hardly think it is so to the Vulgar. But *what alone concerns Science,* in this case, is that the matter *has never been recognised by Writers on the Subject;* but has, as I have already said, been *to all intents denied* by the usual mention made by Writers of the vision of animals who have eyes on the opposite sides of the head, as forming a *contrast* to any of the modes of human vision. As, for example, not only Dr. Reid, but also Sir Isaac Newton, expressly contrasts the manner of human vision, with that of animals who have eyes situated as just mentioned. And, that this opinion of the subject has not notably changed since their time, may be gathered from the following observation in Mr. Wardropp's Treatise on the Eye, page 228; in which he says:—"Throughout the animal king-"dom, those animals who have two or more eyes "employ them to extend their sphere of vision: "but man makes use of both his eyes chiefly as "one organ: little advantage being derived from "his being endowed with a pair of eyes, except "that of diminishing the risk of injuries and dis-"eases."—Nor is the view of the subject entertained by this Gentleman any other than in co-incidence with that of Dr. Potterfield, in his very elaborate and erudite Work on Vision. In that Work, (*Book* 2. *chap*. 4.) in enumerating the advantages of having two eyes; he says they are the following:—1st, "That the sight may be more strong and perfect."—2ndly, That, "When one of them is lost, the other officiates."—And, 3rdly, That, "they enable us to judge more certainly of the distance of objects."—Now, neither of these properties at all embraces the seeing of an object, one half, or part with one eye, and the other half, or part, with the other.

After such examples of the conception entertained by Writers, up to the present moment, of the Nature of HUMAN vision; I apprehend, the nature of the Fourth Mode of Vision, as above described, must strike every person as being remarkably different from any of the Three preceding ones: And it does indeed appear very surprising that no notice is found concerning it, in our extant Treatises on Optics. Were not such quotations, as those above given, so strong to the contrary; I must have supposed, the principal reason of the fact's not having been noticed by Writers on the Subject, has been the want of any suspicion that this Fourth Mode *involves any consequences* in Vision, that are not involved in some one of the Three Modes that are acknowledged. I proceed, however, to suggest, and to consider such consequences.

*First*.—It is sufficiently known, to those who are at all in the subject, that the prevailing, and almost the only considerable hypothesis in order to account for our having erect vision from inverted impressions in the eyes, is the scheme of making the Sense of Sight submit to that of Touch as its paramount lord, that is by assuming that, after our birth we *learn to transpose* the parts of the image in the eye, or to make a supposed *reformation* of the image *(without our being at the moment, or at any time, aware that we do so,)* a sign to interpret, or accord with, the evidence of Touch. And here it may be granted that, some of the appearances are plausibly explained on this assumption; while, also, certain analogies of the operations of the other senses are brought in, to corroborate the hypothesis.

But, notwithstanding any momentary plausibility in some of the features of the scheme just mentioned, the contemplation of so vast an imposition of the Sense of Sight upon itself is more than a rational and duly cautious mind can endure. Certain it is that, this hypothesis has failed to satisfy the minds of different Philosophers. I am not singular, therefore, in expressing my own preconceived dissatisfaction at it. But the matter has not rested here: because Anatomy and the Cases of Persons restored to, or rather endowed with, Sight by means of surgical operations, have completely decided against this hypothesis by the fact that such persons, on their first receiving sight, have found no contrariety, or discrepancy, between the evidences of Sight and those of Touch.

Still, it has happened that no better or more notable hypothesis has been substituted, for that which was thus exploded. And such is the force of long-established opinion that, even, the Surgical decision of the fact might never have been sufficient to prevent an attachment, in many minds, to the Scheme disproved by it. In case, therefore, that any leaven of this really-exploded doctrine may have clung to the understanding of any person ; it may not be altogether superfluous here to examine, in a brief way, the respective claims of Sight and of Touch to superiority on this subject: which, therefore, I shall do, previously to going into farther evidence from the Sight alone.

### COMPARATIVE VISUAL CLAIMS OF SIGHT AND OF TOUCH.

*First*, then ; As it is, in effect, the reasoning of BISHOP BERKELEY that is employed to sustain the prevailing doctrine of Erect Vision, I shall here principally advert to his argument with regard to it. And, not only has it been justly acknowledged by Dr. Reid, that Bishop Berkeley was profoundly mistaken in asserting that our ideas of Sight are *not of the same genus* with those of Touch,—a mistake on the part of Berkeley which I have repeatedly pointed out, and have adverted to again circumstantially in my Manual of the Mind ; but it has been proved on the actual evidence of persons restored to sight, who had never before perceived visual figure, that they recognised such figures, at once, as being of the same kind with those of Touch. So far as this fact goes, therefore, Touch and Sight are shown to be upon a footing.

*Secondly*. Bishop Berkeley, with all his acknowledged acumen, has overlooked a *very material fact in the history* of our Sensations of Sight and of Touch. Thus, he assumes, for his subject, a being who has received his sight *after having learned the whole grammar of Tangible figure*. And, *even in this case*, as I have already said, the art of Surgery has proved the contrary of his conclusion of our making the Sense of Sight *succumb* to that of Touch. *But the real fact*, in the history of our Sensations notoriously is that *every infant, who has the gift of sight, has learned the whole alphabet and grammar of Visible objects,* BEFORE *his feet have taught him the a, b, c of Tactual* objects. An infant, of a year old, is quite intelligent with respect to the figures which it SEES, in all their varieties of form, and their *visual up, and down:* While, yet, he may never have essayed to use his *feet at all;* and, if he has, it is a *new,* and usually a *very vague,* medium of the perception of up, and of down. It would be wonderful indeed then, if, *after being experienced in visual* up, and down, he should *reverse the confirmed decrees of his Sight,* to subject them to those of his Touch!

*Thirdly*. It would be vain to allege, here, that *up*, and *down*, are *mere relative* terms; and that, Sight has *originally* no predilection for which bearing shall be called the one, or the other: For the very same affirmation holds, in the same degree, whether true or false, in the Sense of Touch. To a fly upon the ceiling of a room, provided it had *never seen*, the ceiling would be *tactual down*. And; even, the tactual down of our human antipodes, is the up to us for no other reason than because we *cannot see* the opposite side of the earth. The only philosophical question, in this case is, whether, or not, our Touch causes our Mind or Judgment to reverse the sentence of our Sight, since it is certain and acknowledged that a visual impression in our eyes is inverted, from the position of the external object which occasions it. In other words; Do the SENSATIONS THEMSELVES, of the respective senses, *in reality give contrary evidences of the position of objects actually perceived by them:* And, Is the evidence of Sight reversed by an act of our Judgment, in favor of our sense of Touch; of which act of Judgment we are never aware: Or, Do not the sensations themselves, of the respective senses, give ONE SAME REPORT OF THE POSITION of any object perceived, as the vulgar believe, and as Surgery has proved they do?

*Fourthly*. Therefore, I suggest here, a matter which appears to be usually overlooked—namely—that the terms—*up*, and *down*,—*in any case* of a being endowed with sight, are NOT *the exclusive* property of the *Feet, or Touch;* although they are usually held to be so. The *natural* speech of man says—"*below our feet*," and "*above our head*." And the term—UP—*refers as naturally and originally to our* EYES; as the term—DOWN—*does to our* FEET. Nor can it for a moment be denied that, in point of priority the eyes have it over the feet, as I have already shown in speaking of Berkeley's hypothesis.

The real truth is that, one of the relative terms in question belongs as much to the Sight, as the other does to the Touch; as may easily be confirmed by actual experiment. For, if we sit upon a chair, and look backward between the legs of it; the legs will be *upright to the eyes;* while they are *down-right to the feet;*—that is, the *feet* of the chair will point to the *top of our head,* which point the eyes recognise as THEIR UP, although the Mind or Judgment knows that the evidence of the eyes at that moment contradicts the report of the feet.

*Finally.* The Touch is quite as ready to speak false on the subject, as the Sight. The *down of the feet,* is the thing the *feet rests upon:* and the feet would equally swear that this thing is *down,* if it were ever so truly *up.* The eyes, in their turn, are no less ready to swear that *their up,* (that is the direction above the head,) IS UP, though it were ever so truly *down.* These two Senses, therefore, when pitted in this manner against each other, equally put each other out of court: And it is *only in the employing of crucial experiments of* ONE EYE *as a* TEST FOR *or* AGAINST THE OTHER, that we can arrive at the truth we are in search of.

Fortunately here, the Fourth Mode of Vision puts it in our power to employ this crucial test of the subject:—the non-recognition of which mode has inevitably heretofore prevented the possibility of our doing. Accordingly, therefore, I shall now proceed to state the nature and consequences of this Fourth Mode.*

### FOR THE SAKE OF COMPARISON—PROP. 13.—
### FALLING IN THE THIRD MODE.

*When we see the whole of an external object, either with one eye, or by the medium of an impression of the whole of it upon the corresponding points of each eye; the impression on one, or that in each eye, is known, from the laws of Dioptrics, to be an* INVERTED *impression; and the upper part of the impression, with respect to the lower, is in a reversed position to those of the external object which occasions it; while, also, the impression is inverted* HORIZONTALLY, *as well as* VERTICALLY: *thus every point in the whole impression is transposed; and, hence, we see the object with all its features in a natural order of arrangement; and this phenomenon seems explained if we assume that the* MIND OR JUDGMENT REVERSES *the sentence of Sight, in favor of that of Touch.*

This Proposition, being an acknowledged fact in Optics, requires no present proof. And it is stated here merely for the purpose of illustration, by comparing and contrasting its result with that of the proposition next in succession.

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* The tenor of this paragraph, (which I suffer to remain here,) will show that, when it was written, I had not then anticipated the important fact that an analagous, and still more crucial and beautiful test of the subject was attainable, from experiments which pit the distinct evidences of a *Single* Eye one against another, and demonstrate their perfect agreement.

### PROPOSITION 15.

*When we see a different field of vision with each eye, in each of which fields the objects are of different and marked features, such as if a coach were outlined in one field, and a pair of horses for this coach in the other; if, in this case, we employ the artifice of binocular tubes, and force these two fields of objects to be co-incident in our vision; the* FEATURES *of the respective objects will* CROSS EACH OTHER IN THE TWO CONFOUNDED FIELDS, *but they will do so in the* ORDER *of the external objects, as if the one had* OVERTAKEN *the other: But, it is certain that the impression in each eye is an* INVERTED *impression; if then these ocular impressions were the* ULTIMATE *ones which occasion vision, the* FEATURES *of the respective objects* OUGHT *to cross each other in an order, though natural, yet* CONTRARY *to that of the external objects, that is to say if the external coach and horses are going to the* RIGHT, *the seen coach and horses* OUGHT *to be going to the* LEFT. *But this sort of inversion we never do see: and, therefore, the inverted impressions in the eyes are* NOT THE ULTIMATE *impressions that occasion vision; but vision, in this case, is effected in consequence of* REFORMED AND RECTIFIED IMPRESSIONS WITHIN THE HEAD.

PROOFS.—In the proofs afforded by the last Proposition, (although, most certainly, those proofs might of themselves be rated as being conclusive,) we had only the evidence of a NATURAL JUXTAPOSITION IN THE MEETING of the two halves of an object; which meeting, it was shown, *would not have been thus* if the inverted impression of one half of it in one eye, and that of the other half of it in the other, had been the *ultimate* impressions that occasioned the vision. But, in the proofs of the present Proposition, we have *much more than a meeting* of the objects, because we have the two objects ACTUALLY INTERWOVEN ONE WITH THE OTHER, the particular features of the one being interlaced with the particular features of the other, and yet, so interlaced as to prove, in the highest degree, that the scene is NOT MADE UP OF INVERTED features; because, if they had been so, they must have appeared *as if going, or looking, in a contrary direction* to that of the external objects.

In order to determine this:—If we roll two half-sheets of common post paper into two eye-tubes, of an inch in diameter, and about five inches in length; and if we fit the farther ends of the two tubes with an oil-paper cap on each, on one of which is *lined out in black ink a coach,* and *on the other a pair of horses;* we may then, by applying the two tubes to our two eyes, throw the coach upon the horses: And, in so doing, we shall perceive that the *seen* coach has *overtaken the horses going the same way* as that of the objects lined out on the paper: Whereas, if the *inverted image of the coach in the left eye,* and the *inverted image of the horses in the right eye,* had NOT *been reformed and rectified behind the eyes,* the seen coach must have overtaken the horses *going the contrary way.*

There is a practicable variation of the example just described; which, to some readers, may afford a still more rigorous conviction of the fact which it demonstrates.—If we depict an *arrow* upon each cap of the tubes; and, if we throw the *barbs* of the two seen arrows upon each other, by making the caps approach each other with the BARBS *of the two external cap-arrows meeting each other;* it is certain that, *if they were not reformed within the head,* we must then see, NOT the two BARBS; but, *on the contrary,* the two FEATHERS; *crossed and interlaced with each other.* The reader will understand me when I explain that, if we were to throw the *whole* of each arrow, or object, upon the other, we should be *deprived of the test now depicted:* because, then, we should only, (as in the case of the coach and horses,) have the *direction of going, or of looking,* of each seen object, reversed from that of the external objects, and the seeing of BARB, *interlaced with* FEATHER, would NOT BE A FALSEHOOD IN ITSELF; BUT IT WOULD BE A FALSEHOOD IN ITSELF *if we saw according to the two image-arrows on the retinæ, which are certainly* FEATHER *to* FEATHER, while the two *external arrows are* BARB *to* BARB, *that is in the order in which we actually do see them.* This sort of experiment, indeed, or the phenomena which it exhibits, is the *most crucial sort* of evidence of the reforming of images: because the INTERLACING *of two seen* BARBS, *when an interlacing of two seen* FEATHERS *must have appeared if the images had not been reformed,* proves the most complete *exclusion of the images in the eyes, from the* ULTIMATE *process,* that is possible to be imagined. The Various Phenomena of INTERLACED VISION; which Sort of Vision, on account of its importance as a test of the Subject, well deserves a specific appellation to designate it; will claim attention in a very particular degree, in the sequel of the inquiry.

While the phenomena now described, as being the result of employing two eye-tubes for the purpose, afford a conclusive proof of the fact that was required to be demonstrated; we have from them, as a corollary, the farther fact that, whensoever a visual image in each eye produces *one common field* of vision by the coincidence of their two images behind the eyes, if the *particular features* on each field be vividly marked, they *may with attention,* that is to say as often as both our eyes act effectively, *be seen as being different objects,* UNLESS THEY CO-INCIDE PERFECTLY, although they are interlaced, or ride upon each other in the same field. This, indeed, is a fact known to Optical Writers; and is mentioned, I think, by Dr. Smith, in his Treatise of the subject.

### PROPOSITION 16.

*When we see one half of an external object with one eye, and the other half of it with the other; the inverted impression occasioned by the one half in one eye, must fall upon an* UNCORRESPONDING *part to that on which the impression from the other half falls upon the other eye; and, hence, if these images were* NOT REFORMED AFTERWARDS, *the consequence* MUST *be that, not only must the two halves of the object be seen* PREPOSTEROUSLY, BACK TO BACK, *but also they must be seen* APART FROM EACH OTHER. *But this last phenomenon, (any more than the phenomenon of the* *two halves of an object back to back) is never witnessed: and, therefore, the inverted impressions in the eyes are* NOT THE ULTIMATE *impressions that occasion vision.*

By parity of reasoning from the dioptrical laws of light, and from the experiments of the phenomena which establish those laws, it is certain that an impression of light upon *each of two eyes, that are separated an inch, or more, from one another,* must present to the perceiving mind TWO SEPARATED VISIBLE OBJECTS, UNLESS the separate impressions were converged, and met together within the head: For this case is precisely analogous to that of two separated prepared eyes of a dead animal; which, if placed over against an external object, and looked through, must present *two separated* images of that object: And it is also precisely analogous to the two separated images, one at the top and the other at the bottom, or at any distinct part, of a spectrum of the sun, when the sun's light is divided by a prism.

The truth now insisted upon, moreover, is beautifully confirmed by this fact—namely—that, in the natural process of seeing an object, one half with one eye, and the other half with the other, the internal cerebral converging of the two separate impressions on the eyes brings the two seen halves of the object *exactly to meet and no farther;* Whereas, by the *unnatural force* of two tubes, we *can make them cross* each other; while, by the same reasoning, if they did not converge at all, posterior to the eyes, the two halves *could not meet,* but must *appear separated some distance from each other,* which they never do.

Besides this, also, it is manifest that the two eyes, in any such case, are impressed as if they were *two parallel telescopes:* And two parallel telescopes always produce two images that are SEPARATED; and it is ONLY BY THE CONVERGING of the two tubes of a binocular telescope that they can make an object appear as one.

In a word; The mind perceives two separate impressions on the eyes, *as reduced to one object, by an inversion of the principle of a Binocular Telescope or Pair of Eye Tubes;*—a fact which will form the subject of the next set proposition.

### PROPOSITION 17.

*As it is by the* DIVERGENCE *of the two tubes of a binocular, from the point, or points, of radiance of an external object, that that object is made to occasion* TWO SEPARATE *ocular impressions—namely—one on each eye;—So, by parity of reasoning from the laws of dioptrics, in order that these two separated ocular impressions should afford us a vision of the object as* ONE AND SINGLE, *they* MUST BE CONVERGED, AND MUST MEET *posterior to the eyes, in the head,* IN CORRESPONDENCE WITH THE PREVIOUS DIVERGENCE *of the light through the diverging tubes of the telescope.*

Without farther argument here; I may lay it down for a self-evident truth,—(provided the Visual Organ, here to be supposed, be for the moment assumed to exist,)—that the Mind, by employing its two External or Cranial eyes, together with that internal Visual Organ in the head which may with strict propriety be called a THIRD OR CEREBRAL EYE, and whose existence and structure shall be insisted upon in the sequel; (the whole being considered together, as if they formed an external object, and we as holding a BINOCULAR TELESCOPE INVERTED towards it; while we *i. e. the Percipient Mind itself* is assumed, by the fundamental postulate of Optics, as being POSTERIOR TO THE WHOLE THREE EYES;) the Mind, I say, thus situated, sees (*as it is called*) an external object by the mediation of IMAGES IN ALL ITS THREE EYES; those in the *two Cranial Eyes being separate;* and those separate images being *afterwards converged and rendered* CO-INCIDENT IN THE CEREBRAL EYE.

The mathematical certainty of the *result* of such a convergence, in its fully explaining the phenomena in question, is in fact *One* of the proofs of the existence of the Organ just mentioned: Although, on the first suggestion of such an Internal and Cerebral Visual Organ, I am sufficiently aware, it is for every reader to receive it with a dubiety, or disbelief, proportioned to the novelty and singularity of its nature. But, as I may be allowed to have something at stake in the suggestion of it; I hope it may, for the moment, be supposed that I have not encountered such a hazard without clearly seeing the grounds on which, at least I feel confident, it can be established. At present, however, I shall content myself with saying that, the existence of a Cerebral Eye will be demonstrated, from time to time, throughout the sequel, by a course of reasoning of the very same nature, and amount, as that by which the existence, and the distribution, of light upon a wall is demonstrated by the instrumentality of a prism: THE DISTRIBUTION, OR THE EXISTENCE, OF WHICH LIGHT WE NEVER PERCEIVE, *any more than we perceive the* STRUCTURE, OR OPERATION, OF OUR CEREBRAL EYE.

### PROPOSITION 18.

OUR VISUAL SENSATIONS—*that is our Sensations of Colors—when excited in adapted circumstances, exhibit erect pictures when the external objects which had excited them are no longer before the eyes, nor at all present in our field of vision; in which case, it is manifest, the* IMAGES WHICH HAD BEEN PREVIOUSLY FORMED ON THE RETINÆ ARE EXCLUDED FROM ALL CO-OPERATION, *as much as if they had never existed; and the erect pictures, which we now see, form an object or case of Vision properly and strictly so called, each of them being a picture made up of a* COMPANY OF SENSATIONS OF COLORS, INTERLIMITED BY EACH OTHER.

The Phenomenon pointed out in this Proposition forms an additional and final step of proof, deducible from the co-operation of both eyes, that reformed tactual visual images of external objects are produced within the head; and that, consequently, *erect pictures*, made up of Sensations of Colors, are ultimately produced, and perceived by the mind. I say, it is an *additional*, and *more critical* proof of the fact: For, although it is certain that, when all the former proofs are duly understood and appreciated, they are all equally conclusive, *inasmuch as* ALL *the pictures we* PROPERLY SEE *are made up of Sensation of Color in its varieties:* YET, *as a proof against certain extant doctrines with regard to our mental constitution*, the fact asserted in the present proposition is *more critical* than any of the preceding ones, as I shall here point out.

Thus all Philosophers, except Reideians, being united in the certainty that we never perceive external objects themselves, but perceive them only through the mediation of our Sensations; To all such reasoners, each of the foregoing proofs must be equally conclusive. But, as Reideians assert that we perceive the things of the external world *immediately*, and *not through any medium of sensation;* it follows that, when we have a picture of an object in the mind, and when, also, this picture is NOT OCCASIONED BY ANY EXTERNAL object, but exists in the mind after any external object which had occasioned it is withdrawn from the field of vision; a Reideian, were he the most prejudiced of men, can find no argument to put against this fact, *since the fact proves that we perceive an* EXTENDED WORLD OF FIGURED OBJECTS IMMEDIATELY; while it also proves that, when we perceive (as it is called) an EXTERNAL object, we do so NOT IMMEDIATELY, *but* ONLY MEDIATELY. To establish, therefore, so important and critical a fact, the following, as being one of the most ready and convenient, of a great variety of experiments that would equally answer the purpose, may be put in practice by a reader.

With the face towards a window, in a strong light, hold a large septum between the eyes, so as to cut the window nearly into halves, (*Fig.* 2.) and, with intent to *identify afterwards* the half of the window that corresponds to each eye, hold the septum nearly, but not quite diagonally. Then, look stedfastly at the window, for a few minutes: and having, next, placed a book before the eyes to shield out the light; in a few minutes more will appear, a colored square, or two corresponding parts of a square.—And if, now, the eyes be shut and opened, alternately; there will appear, not a luminous, but a *black, or dark,* picture—namely—that occasioned by the two corresponding parts of the window. And this appearance, variously modified in colors, will appear alternately during a number of minutes. The pictures in this case, moreover, are so vivid, that the window frame which divides each pane of glass will appear, and will be of a bright color when the panes appear dark. The whole appearance will be both powerful and of long-continued intervals, giving ample time, and scope, for reflection upon it.

Every person, in the subject, knows that what is here related, is only a case of what has received the very unmeaning name of "*accidental* colors;" as if all color was not equally accidental, and of one same nature. It is surprising to observe what has been said, by different writers, of this class of Colors. Those who have noticed these phenomena, have confined themselves to conjecturing on the *cause* of them, such as that of *some light*, remaining in the closed eye; or, an irritation of the nerves. But the really-momentous consideration, which is attached to them, is not by what action of light, or of the nerves, they are occasioned; which, however, admits of full explanation; BUT, WHAT IS THEIR NATURE IN THEMSELVES. And, here, it is beyond the reach of denial that they are SENSATIONS OF COLORS, *extended and interlimited into a visual object.* Nor is it possible to deny that ALL VISUAL OBJECTS ARE MADE UP OF THIS SAME MATERIAL—namely—*of Sensation of color, interlimited.* It may be affirmed, with the utmost certainty, that had this fact formed a part of any such Science as Chemistry; and, had the perfection of arts, or manufactures, involving the wealth of individuals, and of nations, depended upon the truth of the matter s being recognised; the doctrine of the *inextension of our sensations* would never at all have lifted its head. Without any other argument to aid them, the Sensations now in question, excited at our pleasure, render it wonderful that any doctrine in the face of them could have arisen in the philosophical world. But, I pass on to the Optical consequence of the experiment above described.

The two unequal but corresponding and nearly-half-images, which alternate in our mind long after the face is turned from the external object which had occasioned them, afford us the most complete certainty that they are no other than *reformed and erect images:* because, as it is certain that the image of each half is inverted in its respective eye; it is certain that, if the half image in each eye *were not reformed within the head,* the two half images *must appear preposterously back to back, which they do not.* And, although this certainty is equally great in any case wherein we are looking at an *external object, present with us;* yet, it cannot but be *more impressive* to any reasoning mind, when it is formed by our own Sensations, *in the absence of the external object.* In a word; I deem this to be of the very highest class of evidence, which we could desire in the subject: although a still more curious confirmation, from this class of phenomena, will be brought forward when I come to treat of extraordinary vision.

## SUB-SECTION TO SECTION THIRD.

### OF THE PRINCIPLE OF VISIBLE PLACE OR DIRECTION OF OBJECTS.

Having, in the course of the foregoing Third Section, laid out the several proofs, which I suppose establish, beyond any anticipation of dissent, that we see by means of reformed and erect images in the brain; which proofs, in fact, place this Department of the Inquiry on the very same footing of evidence with that of the Laws of Dioptrics; and both which must stand, or fall, together; I should now proceed to enter upon another and advance field of Phenomena, in which, the reality of the General Subject in question is to be demonstrated from Data of a still more curious and interesting description. But, previously to this, it appears proper to entertain the consideration of the very important Principle of the VISIBLE PLACE OR DIRECTION OF OBJECTS; because this Principle is involved in the Phenomena already examined. Of the Schemes, which have for their object the solution of the problem now in question, I shall here consider only two:—namely ONE, that has been advanced by Dr. Potterfield, and insisted on by Dr. Reid; and which, also, as far as I am aware, has not been contradicted by other writers, but is the present prevailing scheme of the subject; but, to which I shall specifically object:—AND ANOTHER, which, if the proofs of its reality should appear to be demonstrative, I apprehend must be admitted instead of that first mentioned.—That, which I shall first entertain, is the Principle advanced by Drs. Potterfield and Reid: And this may, perhaps, be the more effectually done by making it the subject of a set proposition.

### OF EXTERNAL DIRECTION.—PROPOSITION 19.— EXTRANEOUS TO VISION.

*The Principle of External Direction from the eye, is a* REAL *principle; and it is employed whensoever we look at external objects, considered by us as such;* BUT IT IS NOT A PRINCIPLE OF VISION: *And, though it is a principle of what is called* SECONDARY *vision, which means a* JUDGMENT CONSEQUENT UPON *an act of vision; the doctrine of Philosophers that, we judge the place of an external visible object to be in a direction* PERPENDICULAR *to that part of the retina* *on which the image of it falls, is not true; because no ray of light can fall thus, except only that which falls on the axis of the eye.*

Proofs, &c.—It having been established, in a variety of ways;—namely—by the reasoning—*à priori*—of Berkeley;—by the operations of Surgery;—and by the Optics of Newton and of all other Writers on the Subject:—And, it being here in contemplation to prove this fact still farther, by demonstrating, as a contrary principle, that we judge of the place of an external visible object from *a Visual Principle of Co-incident Images*:—It remained to acknowledge, here, the Principle of External Direction, as being a real principle, though one that is *extraneous, and only auxiliary, to a proper act of vision:* and this is now done, accordingly, without deeming it necessary to enter into its details. It was at the same time requisite, in this place, to object to that Doctrine which asserts the Principle of PERPENDICULARITY, as above adverted to: Although the fact itself, whether or not this principle is true, is *not directly* in the way, so as to obstruct the proving of the Principle of Co-incident Images: And my principal reason for entertaining it here is that, it will greatly tend to prevent misconception in the mind of a reader, (when he comes to that part of the inquiry,) by showing that Drs. Reid and Potterfield were mistaken, in their reasonings upon our seeing an object double, with one eye. I proceed therefore to the merits of the fact.

And *First*.—I shall merely observe, with regard to the Principle of External Direction; that, with whatever instincts the Deity may have endowed brute animals, it is certain that MAN would never move, in any visible direction, before he had *gained some notion that something was to be got by so doing*. Now, the reasonings of Berkeley, and the operations of Surgery, and the Rationale of the laws of Primary Vision, do all, with one accord, confirm the fact that no man, *prior to experience*, can ever know, from *sight*, that any object is *external* to his eye. Hence, it is no less than a demonstration that, the Principle of External Direction is *not a principle of vision.*

*Secondly.*—It is to be observed here that, Dr. Potterfield has certainly, by different expressions, given up the matter of External Direction as a principle of *Vision*. As, for example, in *Book 5, Chap.* 1., arguing against Berkeley's system, he says:—" In fine this is not to solve the problem " whether it be from custom or experience, or by " an original connate law, that by sight we come " to judge" (JUDGE) " of the situation of external " things, but by exterminating all external things " to make the problem absurd and ridiculous."—Now as, upon the one hand, this just use of the word — " *judgment* " — altogether co-incides with what I shall assert on the subject; so, upon the other, I altogether agree with Dr. Potterfield, that it is by a *connate* law of the mind, that is by an *original law of Vision prior to all judgment, though not by a law that is inexplicable*, that we see objects in a certain direction, as shall hereafter be explained. It would appear, indeed, from repeated expressions that, Dr. Potterfield really meant that we ONLY JUDGE of External Direction; were this not contradicted, as has been shown in a former Proposition, by such assertions as that of *the mind's* "TRACING BACK ITS SENSATIONS OF "COLOR *to the* RETINA, *and thence to the* EXTERNAL "OBJECT."

*Thirdly.*—To come, now, to the *Principle of Perpendicularity;* it appears to me to be *impossible that any* ray, passing through the centre of the pupil, or that of the crystalline, straight to the retina, can fall *perpendicularly* upon that part of the retina which receives it, except only that ray which falls on the *axis* of the eye. And this, too, seems to be admitted by Dr. Potterfield himself, in the following passage from *Book* 3. *chap.* 7.— "When we look, for example, on the word— "*Mathematician*"—(says he) "if the eye be directed to the first letter—*M*,—and keep itself "fixed thereon for observing it accurately, the "other letters, especially those toward the end of "the word, will not at the same time appear clear "and distinct: The reason of which is because "the pencils of rays that come thereupon fall too "obliquely on the eye to be accurately collected "on distinct points of the retina."—Now this is very just: but it plainly amounts to a virtual admission that all the rays *except one* DO FALL OBLIQUELY on the retina:—And, doubtless, Dr. P. would not deny that we judge every letter in the word to be in the direction of the rays of its coincidence on the retina. I must suppose, therefore,tha t the imaginary principle of *Perpendicu-*

*larity* has had its origin in a belief of *some mysterious virtue* in this so-called, but assuredly chimerical principle. As a single, but conclusive proof of its being chimerical; I shall merely mention here that, by the use of my right eye, I plainly judge of the external direction of a book which at this moment is on my right hand, and is so wide of my right eye *as to be nearly at a right angle with its axis;* so that the rays of light, from the book, strike on the side the retina next the nose *with the greatest obliquity possible.* Most evidently, then, I think, the assumption of the Principle of Perpendicularity is a mistake of those who assert it.

From the exclusive use of the phrase—"centre of the *eye*"—by both Potterfield and Reid; and, farther, from one of Dr. Potterfield's diagrams; it would appear that they both meant a *point half way between the front of the cornea and the back of the eye.* But, if they did so; the thing they assert is self-evidently absurd:—because, no ray can fall perpendicularly upon any part of the retina, except the single ray of the eye's axis; since, in order to do so, all the rays must be *radii of a circle whose centre is the centre of the globe* of the eye, which is *a point considerably farther back* than the point half way between the cornea and the back of the eye.

As the last consideration which I shall adduce here, it may be observed that, when we bend an eye upon any field of vision; all the objects in that field, which impress the eye at *any distance from the axis* of the eye *greater than about a third* *part* toward the pupil, must impress the retina with an *obliquity so great*, that it is astonishing how any person could overlook so obvious a fact. And yet, Dr. Reid not only avows Dr. Potterfield's principle of Perpendicularity, as being a *connate or original and inexplicable law of the* mind; but also says, he "*honors him for the discovery.*" I leave the matter, now, in the hands of its judges, especially after they shall have taken into consideration the Visual Principle of Direction which will be proposed, and reasoned upon, in the next proposition.

## PRINCIPLE OF CO-INCIDENT IMAGES.—PROP. 20. —HOW THE MIND STEERS.

*The Mind steers towards an External Object, by making the* SEEN IMAGES OF BOTH EXTREMES *of its path co-incident with the* SEEN IMAGE OF THE OBJECT. *And this Principle, when followed out, is analogous to that of a* MARINER'S COMPASS IN THE CRANIAL EYE, *and* ANOTHER WITHIN THE HEAD; *by means of which, a Spectator perceives External Objects, as a Mariner perceives the Pole; and each, alike, steers toward, or from, or wide of, his object upon One and the Same Principle.*

PROOFS, &c.—At first, and during a considerable part of the investigation of the nature of vision; I had viewed the problem, of the Visual Principle on which the Mind Steers, as presenting one of the greatest difficulties in the whole subject of Optics. I discerned, indeed, that the difficulty was no greater upon my own view of the subject, than upon the scheme of Drs. Reid and Potterfield. But, still, to view the mind as being able, from its watch-tower in the brain, to steer toward an external object which it never perceives; and, to do this by the mediation of an eye or compass which is continually varying its motion in the most complex manner, inasmuch as not only the *eye or compass*, but *also the body or compass-box*, is continually in motion, and the motions of each very frequently differing from and confounding those of the other; appeared to me to exhibit a mystery of the most complicated nature. Dr. Reid, it is sufficiently known, was enabled to *cut* this gordian knot by a single slash of his *Theory of the Mind:* because, according to that Theory, the Creator, by some unaccountable law of our nature, has willed that we should *perceive external objects* THEMSELVES IMMEDIATELY,—a doctrine which, if it were true, would give to his Visual Principle of External Direction some verisimilitude, *though not any real truth*; but which is a Scheme so revoltingly in face of the reason of all Philosophers, (Reideian's alone excepted,) that even the Scotch Professor Brown, the Successor of Mr. Stewart in the University of Edinburgh, judged it necessary to absolve himself from it.

From the early part of my investigation of Optical Phenomena, I indeed discerned that the Mind must certainly steer on the principle of a Mariner's Compass: And I have asserted the same, in a former proposition of the work. But it was not until I had contemplated the matter very repeatedly that, what I conceive to be the true and precise principle of the thing occurred to my thought: and, when it did so, the simplicity of the principle filled me with surprise that I could have been so long kept from discerning it. Whether, or not, I am right in supposing that I thus advanced, from the first general conception of the fact, to a strict rationale of its principle, is a matter which must be judged from the suggestion of the following experiments, which I now offer in proof of it.

Previously, however, it may be expedient to describe, particularly, the *real* difficulty in question; which is this: The perceiving mind, and its *compass the eye*, and its *compass-box the body*, being all one System in a natural or physical point of view; we may naturally *suppose some real, though occult, connexion* between all these, insomuch that an *image in the Cerebral Eye* may have a *similar relative site* on the retina of that eye, to that which was before possessed by its *antecedent image on the Cranial* Eye; and thus the Mind, *in its Place posterior to the Whole Visual Mechanism*, would, consequent upon the *ultimate image in the Cerebral Eye*, see any object *in a* SIMILAR RELATIVE SITE to that which was occupied by the *first image in the Cranial Eye.*—But, when the perceiving mind has to deal with an *external* object; neither it, nor its body, nor its eye, has *any natural connexion* with that object, any more than it has any real perception, or sight, of that object: In addition to which, both the eye and the body are continually confounding the process, by their varying motions: How, then, are we VISUALLY TO CONNECT the Image in the CRANIAL Eye, with the *distant and unconnected External Object*, so as to enable us to steer rightly toward that object?—Now, it has already appeared, Drs. Potterfield and Reid assert that we do this on a principle of EXTERNAL Direction: while *External* Direction, we are to observe, is a principle *beyond* the eye. And, on the contrary, I have here to suggest that, we do so, *not* on a principle of *External* direction; but, on a principle of INTERNAL VISUAL SITE—namely—the SITE OF OUR CO-INCIDENT VISUAL IMAGES, *made up of our* SENSATIONS OF COLORS, which is a principle operating *within* the eye, or brain, or rather and strictly speaking *within the mind itself.* And the following is the test, which I now propose for the subject; observing only that, to an unphilosophical reader, the one principle may perhaps appear to be identical with the other; but, to a philosophic mind, the difference must be discerned to be real and great, and its *consequences* still greater. The difference, indeed, may be briefly expressed even here; and it is no less than this: that *any* principle WITHIN the eye is a *principle of* VISION *properly so called;* but *any* principle BEYOND the eye is *not a principle of* VISION, but is a principle of JUDGMENT, *subsequent* to *experience.* The real difference, therefore, between Drs. Reid's and Potterfield's principle, and that which I propose, is that they think we SEE objects in a certain external direction; whereas, I intend to show that we ONLY JUDGE THEM TO BE in a certain external direction *in consequence of our* SEEING A CERTAIN

CO-INCIDENCE OF IMAGES.—I proceed, to the proofs of this proposition.

EXPERIMENT FIRST.—When a novice in the art of shooting first takes up a gun, with intent to fire at a mark; he will, almost inevitably, hold it in such a position, that the *upper side of the barrel* will present the *visual image of a very short line* to his sight; and the consequence of this will be that, his *shot will pass over* the object, *at a distance above it proportioned to the length of the* IMAGE. But, if a practised hand should take up the gun; he would, *from acquired judgment,* bring the *image of the silver* "SIGHT" at the end of the barrel *as nearly as possible in one* with the *image of the top of the* BREECH; and, would *also bring* BOTH THESE IMAGES *nearly in one with the* MIDDLE OF THE IMAGE *occasioned by the external* "MARK;" by doing which, he would reduce the *image of the line* of the barrel to *almost a mere sensible point:* And the consequence of all this would be, his ball (if the other circumstances were right) would hit the middle of the mark.—Such, and so simple and familiar, is the experiment by which I here introduce to the reader the VISUAL PRINCIPLE OF CO-INCIDENT IMAGES,—a principle which, I have no hesitation in believing, forms the key to the right understanding of the curious fact HOW THE MIND STEERS with regard to EXTERNAL OBJECTS.

Now it must be evident that, *all that* VISION has to do, in this experiment, is to GIVE NOTICE WHEN the three *Images*—namely—that of the MIDDLE *of the external mark or object,*—and that of the silver "SIGHT,"—and that of the TOP OF THE BREECH *of the barrel,*—are ALL CO-INCIDENT IN ONE SAME VISUAL POINT: For it is JUDGMENT, from experience, that *points the gun;*—and *judgment,* from experience, that *knows the shape of the barrel,* and knows also *both the existence and the direction of the external object:* And all that VISION has to do, in the matter, is to REPORT ITS EVIDENCE TO THE MIND that the THREE IMAGES *have gained* ONE SAME SITE, before our Judgment shall order the discharge of the barrel. And this is so certainly true that, I affirm, if a gun had been placed before the eye of Cheselden's patient, the hour after he first saw; and, if any skilful hand had directed the gun to the middle of a mark; this patient would have declared the *middle of the mark,* and the *silver "sight,"* and the *top of the breech,* to be *all one same small object,* of about the size of a large pin's head; and this object he would confidently believe to be *touching his eye,* and NOT *to be* AT ANY DISTANCE EXTERNAL FROM IT.

It is always to be duly remembered that VISION ITSELF is an act of JUDGMENT. For *mere sensation of color, without perception of variety or form,* could not be called vision: and it is *Judgment* that informs us when the images in the mind are, or are not co-incident. But an act of vision is a PRIMARY Judgment: and the Judgments that this vision *has an external cause;* and, that this external cause is in *this, or that, direction;* are *Two Secondary* Judgments, extraneous to vision.

If I may be allowed here to express my feeling, of a matter which at least impresses me very strongly; I cannot help thinking the example, now given, involves the whole arcanum of the STEERAGE of the mind and body, towards an object, with equal simplicity and truth. Because, in order to put this principle to the last degree of ordeal, if we take the most extreme and preposterous case of vision imaginable; as, for example, if a man were to thrust his head, inverted, between his legs; and, then, looking backward, were to see an external object at which he desires to shoot;—he has *only to bring the three images* (already mentioned) into an *apparent coincidence;* and, if all other circumstances be right, he must be sure to hit his mark, even though his eye, his head, and his body, were all of them *ever so completely twisted* from *their natural and corresponding order.*

And here we are called to observe that the Principle just described is precisely analagous to that by which the Mariner Steers by his Compass.—The CAPTAIN Mariner, sitting below in the cabin of his ship, and looking on his Compass, knows *precisely as well,* and precisely *on the same principle,* as the helmsman who is on deck steering the vessel, that the ship is steering to "DUE NORTH:" For, in order to be certain of this, he has only to observe that the North Point of the Magnetic Card is "IN ONE" with the "SIGHT" marked on the card-box; which "*sight*" is always IN ONE with the *ship's head;* and, then, (provided the compass have *no variation*) he is assured that his vessel is sailing due North. Precisely, then, it is the demonstrated fact from the case of the gunner as above described, that the Perceiving Mind, *in its Cabin in the Brain,* has only to observe WHAT RELATIVE SITE *is occupied by any* SENSATION OF COLOR, AS IT IS EMBRACED BY ANY OTHER sensations of colors; and the mind is then assured, by its Judgment from experience, that an external object is at that moment in such a direction from the eye, that a gun so held that the images of its two extremes and the image of the object shall be all co-incident, shall, if discharged of its ball, occasion that ball to hit the object.

From such experiments, then, it is evident that the CRANIAL EYE is analogous to a *Mariner's Compass placed on* DECK; while the CEREBRAL EYE is analogous to *another compass placed* BELOW IN THE CABIN, and while, also, we are carefully to observe that the *last mentioned analogy is not the* FINAL one, since, in strict fact, the ULTIMATE *Visual Compass is made up of our* SENSATIONS OF COLORS, *including their varieties and interlimitations, in the mind itself.* Notwithstanding this last distinction, however, it is beyond all question that, the *Generic Principle,* on which the Mind steers, is certainly that by which the Mariner steers—namely—When the Mariner steers by his COMPASS, (*as contradistinguished from his steering by a land-mark,*) he does NOT SEE the far distant object to which his Compass guides him.—And, precisely on the same principle, the Mind *never sees* any external object: but it always steers by the help of its Co-incident Sensations of Colors; by which, as by a Compass, it is guided to its object.—In a word; It is, by the above example which illustrates it, put in proof that the Mind steers by the *mediate instrumentality of a* SERIES OF COMPASSES—namely—by a SERIES OF THREE SEVERAL compasses;—*the last one being made up, as already said, of Sensations of Colors in the Mind itself.*——And, hence, we are led to discern a large additional cause of wonder, and of adoration, of the wisdom and goodness, along with the power of the Creator; in his enabling us, by such an unavoidably duplicated system of Visual Mechanism, to preserve our existence, as well as to attain a knowledge of our own and of his nature.

Such is the complete effectiveness of the Principle of Co-incident Images, now proposed, that, as a striking example of its efficacy, I observe, however extravagant it may appear, if a man, or an animal, had an eye, *not in his head*, but situated, like that of a Snail, at the *extremity of a feeler;* and if this feeler reached from here to the Continent of America; this animal, standing on English ground, might steer truly toward any external object in that distant region; and this, even, if the feeler should be ever so much *distorted, or even turned backward;* by only preserving the visual image of the object co-incident with that of some other co-existent visual image, as will be demonstrated by *the following experiment*. As a test, at this moment, however, of the truth of this position; I need only point to the manner in which a novice begins to employ an *inverting telescope: which he is sure to move from side to side in* DIRECTIONS THAT CONTRADICT HIS PURPOSE; until, at length, taught by experience of his repeated mistakes, he finds that, *whatever be the nature of the instrument, or of the motions he must employ in using it,* the ONLY PRINCIPLE by which he can attain his purpose is that of CONSULTING THE PLACE OF THE VISUAL IMAGES IN HIS SIGHT.

EXPERIMENT SECOND.—The only difference between *shooting at* an object, and *walking on a path toward* that object, is but a *slight variation of the case; without so much as a specific difference in the* PRINCIPLE. Thus, if we should stand upon the curb-stone of a street-path; and desire to walk on this curb-stone, as a path, toward another person who is at any distance from us on the same line of stones; we should first view the *image* which the *line of stones* makes in our sight; and this image would appear to form a *very short line of object.* We should, next, proceed with our *feet,* as nearly as possible as we did with a *gun* when we have been shooting; that is, although we cannot reduce the *image of the other person,* and that of the *line of curb-stones,* and that of our *feet,* all three to a *strict co-incidence;* yet, we shall approach as nearly to this act as possible; and our judgment, the while, is awake to the variation in the case, insomuch that our eye is, as it were, *actually shooting at the person every step we take,* and it is *also better directed* to its object than a gun usually is in the hands of a novice.

In this case, it is plain, if the other person were so far off as to appear no bigger than a *sensible visible point;* he must appear to be the *mere farther* *end of the line of curb-stones.* And if, at the same time, we could bring our feet to occupy the presenting place of the breech of a gun; the act of *walking* would become an act of *shooting*. Upon the other hand, it is evident, that if, when we are in an act of *shooting*, the mind could get out of its ocular window;—it might then be conceived to *walk along the gun-barrel, as on a path, to its object*.

As a practical and familiar confirmation of the principle now advanced—namely—that it is VISUAL SITE that is the real principle of steerage of the mind and body; I need only point to an *ordinary foot-path*, which men make across a large field. The general character of such paths is that, they are *not straight*, but are usually *crooked or meandering*. Now the reason of such meandering is evidently this:—There being *no visible straight* path marked out at first for a guide to the sight of the *first traveller;* he is unable to steer himself steadily *from a want of the co-incidence of the several requisite images:*—and although, all the while, his *judgment* informs him *vaguely* that he is steering toward his object; he can gain *no precision* in his steerage, from a *want of the marks* which alone could give such precision. Some foot-paths, indeed, may be straight; because the aberrations of a second traveller may be *contrary* to those of a first: And this, and other accidents, may occasion a path to be not meandering. But it is a notable fact that the *generality* of foot-paths *do* meander: And, I think, I have here *assigned* the true cause of it.

In order to illustrate and confirm the principle in question, still farther; Let us here observe how the Mariner steers his vessel, in order to approach *straightly* toward any port, or point of land, when a thwarting tide or current is conveying his ship in a direction wide of that of her head. The mariner, (if he can,) KEEPS OR MAINTAINS THE VISUAL IMAGE OF ANY LAND OBJECT, IN ONE with THE VISUAL IMAGE OF ANY OTHER *land object beyond it;* and, *so long as he can maintain this co-incidence of the images of the two objects* in his eye, and mind, he never cares farther about the tide or current; for experience has taught him that the principle of co-incident images carries him surely and safely to his anchoring place.—It is to be kept in view, here, that the Mariner, the Traveller, the Gunner, and perhaps the Snail, are all, by the beneficent imposition of Providence, cheated into a confident belief that it is the EXTERNAL OBJECT of their steerage that they SEE: And it is only the Philosopher, of the School of Locke and of Newton, that recognises the real truth—namely—that they see nothing beyond the Visual Modifications of their own minds.

To enable readers to judge, now, of the difference in philosophicalness, between the Scheme of Drs. Potterfield and Reid and that here insisted upon; they have only to observe that our steerage by *Co-incidence of Images* is here accounted for by a *regular and strict rationale;* though, indeed, it amounts only to a very short and simple one: While, on the contrary, the SUPPOSED VISUAL *Principle of External direction* is held up, by its assertors, *as a mere fact for which they not only do* *not pretend to account; but which, they expressly assert, is hidden from all such attempts; and which, therefore, they call a connate or original law of our nature.*

If it should be objected here, or at any stage of this investigation, that *several co-incident* visual images must form *but one confounded, or single image:* I answer; This was provided for, virtually, in describing the first experiment: and it was *never intended* to be asserted, even in the case of shooting at a mark, that we bring the several visual images into a *strict, accurate, or complete,* co-incidence: But, we universally bring them *so very nearly* into a strict co-incidence, that, the dullest understanding must discern that the VISUAL PRINCIPLE *of the* PLACE *or* DIRECTION *of* OBJECTS, WHEN DULY FOLLOWED OUT, RESOLVES ITSELF INTO A STRICT *co-incidence* of images, as *being that of its ultimate and essential nature.*

Upon the other hand; If, with a view of depreciating this Principle, it should be said that, after all that has been advanced, every clown who has handled a gun must have known the principle before it was here suggested: I answer; Not only did every such clown know it, *in a certain way;* but, *also, the very essence of it,* AS A VISUAL PRINCIPLE, *consists in the fact that* ALL MANKIND knew *and practised* it.—*The only matter for our philosophical* consideration of the thing is that, *no Philosopher had ever explained it.* As an example, in proof of this; the exposition given by Drs. Potterfield and Reid has been demonstrated to be contrary to the truth of our nature, PRECISELY ONLY BECAUSE *it has been demonstrated to be contrary to the knowledge of a fact* PRACTICALLY KNOWN AND RECOGNISED ALIKE, BY ALL GUNNERS AND ALL OTHER MEN, though it was never THEORETICALLY EXPLAINED by any one.

On this occasion, it may be of service to repeat a remark, which I have made in a former work with regard to the perception of *Visible Outline or Figure;*—namely—that, in some of the most important departments of Philosophy, *mankind in general know in* ONE AND A PRACTICAL sense, what neither themselves, nor Philosophers for them, know in a PHILOSOPHICAL OR RATIONAL sense. As an example of this; it is certain that, from the beginning of time, every painter's boy must have known that, *without some two contrasting colors,* there can be *no visible line or figure:* And yet, no Philosopher had ever discerned that a *visible line is purely nothing but a meeting and contrast of two of our different Sensations of Colors.*—In such cases of philosophical oversight, it appears to be the *extreme simplicity* of the fact that forms a subtilty which causes the thing to escape detection. Nothing in the world can be *more simple,* or more *self-evident,* when brought within our apprehension, than the nature of a visible line, as that nature is demonstrated in the laws of our visual sensations laid down in Section First of this inquiry. And *this very simplicity* could be the only reason why all philosophers have *overstept* it, in some such way as a man oversteps the threshold of a door before he is aware that he is beyond it. This appears to be so manifest that, as I have on a former occasion remarked, even the acute Bishop Berkeley, *throughout his speculations on Vision, never doubted that every visible line is a* " BLUE," *or a* " YELLOW *line," or a line of* SOME OTHER COLOR. Impressed with this simple nature of the thing; I have on a former occasion, (in replying to a letter of Professor Stewart in which he says—" You have my free consent to take the credit of the discovery,")—deemed it due, in allusion to the word " *discovery,*" to state that I never valued myself upon evincing any particular acumen in the discernment of the laws of Visible Figure, unless on the comparative ground that no person before me had discerned them. But here, in consequence of the entertainment which these laws of Vision have received, I cannot withhold the expression of my belief, (without annexing this belief to any illiberal imputation upon any one,) that if they had belonged to Mr. Stewart; or, been launched from the Chair of a Metaphysical University; Europe, at large, would have heard of them before this time.

As for the *Visual Principle of Co-incident Images*, here insisted upon; Although this Principle is indeed *less simple* than that of a Visual Line, it is *yet so simple* that, this has probably aided much in its escaping the notice of such erudite and considerable inquirers as Drs. Reid and Potterfield. Of the great probability of this; I can offer a fact of my own experience: And I will here furnish this fact, in case it may at any time serve the cause of philosophy, by forming a guide to future inquirers on other subjects. The fact is that, few persons have been more early inured to the use of the gun, or have for half a life been more daily in the practice of employing it, than myself: consequently, I must be as intimately acquainted with the visual principle of co-incident images, *considered as a practical* principle, as with any daily fact whatever. *And yet*, at this late period of my life, when I was *seeking for the rationale of the steerage of the mind by the eye;* although this desideratum has here been demonstrated to be *founded in the practical principle in question, and in this alone;* it cost me *very repeated reflection, for some weeks,* before the practice of the gun occurred at all to my aid; and I was, all that time, under serious doubt that the rationale of the subject might prove ultimately a thing not within human attainment.

Upon this, I would farther point out, for the sake of future inquirers, that, although it is strictly true, as has been proved by *Experiment Second*, that we *walk toward* any object on the very same principle of co-incident images as we *shoot at* any object; YET, if my attention to the fact *had not been previously drawn by my reflecting on the way we act when we are* SHOOTING, I deem it to be a considerable chance, I might never have arrived at the principle at all. And this appears to be so probable, that, I do not much believe any person would have arrived at the principle in question, who had never handled a gun, or some other such instrument. Whether Drs. Reid and Potterfield were sportsmen; I know not. But, if they were not; it may account for their adopting, and reasoning upon, the Chimerical Scheme of our SEEING *Ex-*

*ternal Direction;* and for their not having fallen upon the Principle of Co-incident Images.—As a farther evidence of this; I observe that, *since* the principle of co-incident images has occurred to my mind, I perceive, plainly enough, that the use of a *Telescope* involves this principle. And it certainly appears that Dr. Reid was used to *Telescopes.* But, in employing a Telescope, the principle in question is *not near so obvious to notice,* as in the case of using a gun; insomuch that, although I had myself been in the habit of using Telescopes in early life; this did not in the least suggest to me the principle now under consideration, and perhaps it never would have done so.

And here closes what I had to suggest and demonstrate with regard to the Principle of Visual Place, or Direction:—the real nature of which, if it has been truly explained, is certainly, *owing to the Pneumatological consequences which it involves,* one of the most important considerations in the whole compass of Optical Science; And here also ends what was intended to be advanced with regard to that Fourth Mode of Vision, the suggestion of which I was induced to hazard; and from the nature of which, I have delineated so large a portion of the rationale now submitted to the reader.

# SECTION FOURTH.

## OF ERECT VISION WITH A SINGLE EYE.

### INVOLVING THE CROSSING AND REFORMING OF IMAGES BEHIND THAT EYE.

### *Introductory Matter.*

The field of Visual investigation upon which we are now about to enter, is one which I had by no means anticipated when I first resolved to entertain the subject of Cerebral Vision. The phenomena and results which I had in the beginning observed, as contradicting the existing doctrine of single and erect vision, appeared to me to be fully sufficient to establish all that I then desired to suggest. Although, if there had been no farther field of investigation in the subject, it would certainly have rendered the inquiry a matter of comparatively small extent, when contrasted with that which it will occupy from the additional department examined in the present section. In the course, however, of laying out the matter first mentioned, as has been done in the foregoing Sections; and, in resorting to the experiments requisite for its proofs and illustrations; it could not well have happened that my attention should have remained uncalled to such Phenomena as those of Extraordinary Vision with One Eye: a variety of which, have been treated by Drs. Potterfield and Reid; and quoted particularly by the former, from the experiments of the French Philosopher Mons. de la Hire. And I had no sooner turned in this direction than I was struck by the general fact, the consideration of which will occupy some space in my remarks upon it, previously to going into its proofs.

In this place, it may be proper to advert to what I shall particularly explain in the Preface to the work—namely—that the objects of my habitual research, and the circumstances of health which have attended and have frequently interrupted their progress, had altogether prevented my affording any serious attention to the subject of Optics, notwithstanding all its acknowledged interest, and also notwithstanding its being in part connected collaterally with the objects of my usual pursuit. And this more especially was the case in consequence of my not having, until very lately, at all suspected that any practicable field had been left open in this Department, for any investigation of the nature of the present inquiry: the mention of which fact will explain why I was not sooner called to examine such phenomena as are now about to be considered. This being understood; I subjoin the following observations.

From the results of the experiments which will be described in their proper place, I feel confident, it will not for a moment be denied that the general fact, now in question, opens to our view a new and most interesting field of knowledge of the Mechanism of Sight; since, in addition to the results of those dioptrical reasonings, which have in the foregoing Sections established the fact of the convergence and ultimate co-incidence of every *two corresponding impressions, one in each eye;* we are now called upon to contemplate a *similar system of mechanism existing in each eye singly,* altogether apart from, and independent of, the mechanism of the two eyes when they act in concert.

Among the other consequences, of the fact now suggested; it must be attended by one, which I may mention here—namely—that whereas it might otherwise have happened that we might be fain to grope, more or less in the dark, in attempting to determine the *precise* place, within the cerebral mass, at, or by the instrumentality of which an ultimate and co-incident impression is formed in consequence of a previous impression upon each of the two eyes: Or, even, if this place were ascertained with only a considerable degree of probability, leaving any portion of doubt, or denial, in the minds of some readers, and incomplete satisfaction with any:—In either of these cases, the fact of Double Functions being displayed by a Single Eye must vastly aid toward the complete solution of the problem; since the *place* of *meeting,* in the case of a SINGLE eye, *must be somewhere* ANTERIOR to that where the analogous operation in the case of BOTH eyes takes place; and the precise place must be more open to detection.

The Phenomena, to which we are here in the first instance called to attend, as they are described by Drs. Potterfield and Reid, I may notice in the following general terms.—Make two, or three, or any greater number of pin-holes, in a card, within such a distance from each other as will admit rays of light to enter the pupil of the eye through all of them at the same time; and, sticking a common pin up in your view, from any distance *either within or beyond the distance of distinct vision*, look at this pin through the holes: whereupon, you will see as many pins, or pins' heads, as there are holes in the card.

Dr. Reid, in the course of treating this general fact in several of its modifications, dwells upon it as being very wonderful; and points out particularly the consideration of its surprisingly *contradicting* the ordinary laws of vision. And there is a sense, in which this his remark is just: of which fact, he enumerates several instances. But, while I make this admission, I would rather affirm, as being by far the most important feature in the case, that there is another and far more important sense in which the general fact very wonderfully and beautifully *corresponds with and confirms* the ordinary laws of single vision with both eyes. With regard to any suggestion, or suspicion, on the part either of Dr. Reid or Dr. Potterfield, of any such important result as being deducible from these extraordinary phenomena; there is no such matter adverted to by them, more than by any other writer. On the contrary, the only use they make of the phenomena, is to furnish a proof, as they deemed it to be, that we see objects in a certain *External Direction*. And, with regard to that attempt, I rest upon the confidence that its merits have been decided in the 19th and 20th

Propositions of this inquiry. As for the *supposed proofs*, which Dr. Potterfield, (and Dr. Reid after him,) gives from experiments upon two holes in a card; I shall only observe that they could be plausible in no case, except in any case wherein the objects impress the retina *near its axis:* And, even then, the *proofs* are *certainly not sound*, though they may at first sight appear specious:—I ought to add that Dr. Potterfield, singly and condemned by Reid, has employed the same phenomena to establish his position that we SEE *the distance of objects from the eye.* But, I think, neither of the Writers in question has evinced any other conception, as being deducible from these extraordinary phenomena.

From a phenomenon known to Writers on Optics, it is a property of the eye, that, when the pupil is rendered opaque in the middle, it causes double vision of a small object presented to the diseased eye. And, from this fact, I from the first discerned that a single eye, in this case, operates on the principle of two corresponding eyes. In consequence of this, I introduced a Proposition in Section Second; the substance of which will be embodied and absorbed in the Propositions that are now to follow. In the same place, and upon the same ground, I introduced another Proposition, with regard to the known fact adverted to by Dr. Reid, as well as by Dr. Potterfield, that *not only a central ray*, but equally *any collateral and converging* ray, that enters the pupil of the eye from an external object, will make us see that object in the direction of the *central* ray: From which case I argued that, *as it is solely because the collateral ray, or rays, are* BENT, after they pass the pupil, that they make us perceive the object in a direction that is *mediate between* themselves and rays which should pass at an equal distance on the other side of the pupil, (which is the real fact,) so, by parity of reasoning, it is solely because two separate impressions of light, in our two eyes, are *conveyed, or reproduced posterior* to the eye, that they make us perceive the object single and in a position in a line intermediately between the positions of the two eyes. But the Propositions, now alluded to, were founded on mere reasoning—*à priori*—from the GENERAL assertion of the facts by Writers on the subject: And I had not then had the curiosity to resort to the experiments described by Potterfield and Reid. It remains only to say that, the moment I resorted to the experiments, my attention was called to a class of Phenomena which present themselves to the single eye, without the aid or intervention of holes to divide the pupil into two or more pupils; and the appearances, in this case, are so precisely of the same class as those which arise in certain cases when we see objects with *both eyes together,* that, it was quite manifest, the most interesting results were involved in the fact.

1.—AND FIRST:—It becomes certain that, *Each Single Eye has corresponding, and uncorresponding,* points on its retina, *that is to say on opposite sides of the eye's axis.* For, when we see a pin's head double; *one* of the heads is on *each side of the axis,* and is equally distant from it: because we *cannot* *see the head double,* unless we look *directly* at the pin, that is to say with the axis of the eye in one with the pin: In proof of which, if we direct the eye a little on either side of the pin, and carry the hole in the card aside with it; we instantly lose sight of one of the two heads, in consequence of the *septum of the card falling in a direction with it.*

• 2.—SECONDLY.—It is a fact strictly demonstrable, from the extraordinary phenomena now in question, that, in the case of Vision with a Single Eye, the *visual rays* RE-CROSS EACH OTHER AFTER FALLING UPON THE RETINA; and thus are made to produce a REFORMED *tactual visual image* SOMEWHERE BEHIND THIS EYE, YET BEFORE *they reach the place of junction of the tactual visual impressions produced on* BOTH *eyes:* And thus, each eye, acting by itself singly, produces a *reformed and erect* tactual visual image; which image is conveyed backward, and is at length discharged on the perceiving mind as well, and in the same manner, when we *see with only one eye,* as when we see with both eyes. And it follows therefore that, in each case, and in all cases universally, the *tactual visual images, or impressions,* which discharge themselves upon the mind, ARE ERECT, *and are* NOT INVERTED.

When we duly contemplate the thing, now suggested, we are naturally led to the following consideration. It is evident, the moment our attention is called toward it, that, after proofs had of the existence and operation of a Visual Mechanism for the re-crossing and rectifying of impressions when we see with BOTH EYES; we must *expect* the existence of a similar provision in the case of seeing with ONE EYE ONLY; and, from the beginning, it ought to have been anticipated that, in case of proofs of the former, we should have to look for that of the latter.—But, the little expectation which could well have been entertained, of our actually arriving at any such proofs in the operation of the Single Eye, might have been sufficient to deter any one from the whole investigation. In this case, therefore, it was perhaps fortunate that the difficulty did not occur to my thought, until the phenomena themselves suggested to me, at once, both the obstacle in all its magnitude and the unexpected removal of it. Of the truth of this, however, the reader has yet to be satisfied. And I am led to mention the fact, here, only as a step in the *history* of the subject which may possibly have its use for some future inquirer.—To the proofs, therefore, of this department of the subject, I now proceed.

### PROPOSITION 21.

EACH EYE, SINGLY, *in adapted circumstances, can perform similar functions, of* SINGLE *and* DOUBLE VISION, *to those that are performed by the two Eyes acting in concert.*

PROOFS AND ILLUSTRATIONS.—In laying out the proofs of this important Proposition, it is proper to notice that, the instrumentality of any such artifice as that of dividing the pupil of the eye into several pupils, by looking through pin-holes in a card, is not essentially requisite; because the most important of the phenomena which will form our data, may be perceived by the naked eye: Although, in some cases, the device of looking through eye-holes will enable us to perceive the phenomena more vividly, and clearly: And, in others, we shall find the purpose answered better by employing a lens, or even two lenses. I shall, nevertheless, commence the proofs in question by taking into consideration the phenomena we perceive when we employ two pin-holes in a card, for the purpose of seeing a pin's head, or any other small object, double: because there is a certain subtilty in the exhibition of the SEEN objects in question; which neither the expositions of Drs. Reid and Potterfield, nor yet the diagram supplied by the last-mentioned Writer in illustration of his solutions, at all advert to: nor could a reader completely apprehend the subject, unless a full exposition of it were expressed; and this exposition illustrated by Figures explanatory, like those which will be supplied herewith.

Besides the object in view, as above mentioned; I shall embrace this occasion to render the phenomena, discerned by means of pin-holes, the example by which to introduce the suggestion of the *re-crossing and rectifying* of the inverted retinal images of External Objects; or, rather, and to speak strictly, of the *production, or formation, of erect tactual visual images within the head, or the brain,* IN CONSEQUENCE OF *inverted images impressed upon the retina.* At the same time, I request it may be observed that, I propose to do this in the present Proposition as being little other than a description, and not as being the final test, or proof of the fact. And, hence, I have reserved the formal proposal of the re-crossing and rectifying of images behind the Single Eye, to form the title of the next set Proposition; because therein the crucial and final tests of the fact will be regularly stated.

With regard, then, to the introduction of the fact of the re-crossing and rectifying of tactual visual images behind the Single Eye; it is to be observed here, as a preparatory step, that Dr. Potterfield has described the phenomenon, which I propose to employ in the suggestion of it, in the following terms;—"Axiom 2."—"When an object "appears double, from its being seen with one "eye, through two small holes in a card, if the "distance be greater than that to which the eye "is accommodated, upon covering either of the "holes, that appearance that is on the same side "will be made to vanish; and if the distance "be less than that to which the eye is accommo-"dated, upon covering either of the holes, the "appearance that is on the contrary side will be "made to vanish."

Now, with respect to the axiom of the subject thus stated; I have in the first place to remark that, while it is true without any ambiguity in the case wherein we are beyond the *greater* of the two distances mentioned; it is not true without ambiguity, (although it is true in the sense in which, it appears, Dr. Potterfield intended it,) in the case wherein we are within the *lesser* distance. The real fact of the matter, in both cases alike, is,—the word—"*appearance*"—in the axiom of Dr.

Potterfield, is an ambiguous expression; because, in both cases alike, we *see two objects,* both of which have a fair claim to the name of an *appearance,*—namely—the *pin's head or other such object, and a circle* in which it is seen. Now, when we are *beyond* the limits of distinct vision, if we close either hole in the card, we lose sight of *the pin's head, and of the circle* in which it was seen, *both being on the same side:* but when we are *within* the limits of distinct vision, if we close either hole, we lose sight of the *pin's head* on the contrary side, as Dr. Potterfield has asserted; but, along with this, we lose sight of the CIRCLE *that is on the* SAME *side* with the hole that is closed; and here, then, is a discrepancy of fact, from that observed by Dr. Potterfield; and a very curious and subtle phenomenon, to be accounted for.

The exposition of the matter is this.—Although it is true, according to the description of such experiments and results as that given by Drs. Potterfield and Reid, that the rays of light from the external pin's head, in their approach to the retina, have *not crossed;* yet, the *rays of light let in by the pin-holes,* and which *occasion the retinal images of the two* SEEN *circles,* HAVE CROSSED *in a very large proportion, though not altogether.* And, hence, the LEFT-*hand* SEEN PIN'S HEAD *is within and belongs to the* RIGHT-*hand* SEEN CIRCLE; so that, when we lose sight of the *right*-hand *seen circle,* from stopping the right-hand hole, we must lose sight of the *left*-hand *seen pin's head* along with it. As a test of this exposition; when we have *removed beyond* the distance of distinct vision, the *retinal images of* *the seen circles* will have crossed ALTOGETHER; and therefore the retinal images of the *pin's heads* will have crossed along with them, because each image-pin's-head *must be* SEEN *within its own* CIRCLE. The truth of this exposition, moreover, will be illustrated and confirmed by the Diagrams which are supplied for this and other purposes.

But this exposition, as far as it has gone, is, as I have already said, *only preparatory* to the suggestion of the re-crossing and rectifying of the inverted images formed upon the retina of the single eye. And this fact, now to be entertained, is the following.—When we are *within, as well as when we are without,* the limits of distinct vision; the rays of light which form the inverted retinal images of the CIRCLES occasioned by the two eye-holes have *met;* and while, in the *latter* case, they have *also crossed altogether;* in the *former* case they have *crossed only in great part,* leaving a *small portion of intersection,* which portion of intersection is always *seen of a brighter color* than the other part of the circle on either side of it. But, when we are *within* the limits of distinct vision, the rays of light which occasion the two retinal images of the *pin's head* have *not crossed, nor yet met.* And, as the *right-hand retinal image of the pin's head* is certainly *within the right-hand retinal image-circle,* (BOTH being occasioned by the *right-hand hole;*) it follows that, the two images are impressed on the retina according to the *dotted circle and dotted pin's head* in *Fig.* 3. of the Plate in illustration; that is to say, the *greater part of the image-circle* is impressed on the *left* of the eye's axis; and the *image pin's head* is *near the edge* of this circle, but falling on the *right* of the eye's axis.

The above-described process, we are to observe, is the fact of the case *in so far as concerns the* EYE—*i. e. the* CRANIAL EYE. But, in order to afford us a VISION, in consequence of this Ocular fact; and, in order that this vision should be ERECT; I have here to suggest that there is, wonderfully provided, a Mechanism *behind the Single Eye*, analogous in its operation to that which has been demonstrated behind BOTH eyes in the case of two-eyed vision; and, from the operation of this Mechanism, the SEEN CIRCLE, *with the* SEEN PIN'S HEAD WITHIN IT, is revealed as if it were situated on the CONTRARY *side of the eye's axis* to that on which, we know from the laws of Dioptrics, it is impressed on the retina. Thus, while the *retinal impressions* are made according to the *dotted parts* of *Fig.* 3;—the VISION—*i. e.*—the SEEN CIRCLE AND SEEN PIN'S HEAD are seen according to the *black-line parts* of that Figure.

It is easy to discern that, the above being the nature of the fact perceived when we either employ, or stop, the hole on the *right* hand; a corresponding process will follow if, instead of this, we either employ, or stop, the hole on the *left*,—we being all the while WITHIN the distance of distinct vision; and the appearance will be that represented in *Figure* 4.

And, when *both* holes are employed; and we, consequently, see two pins' heads; they will appear as in *Fig.* 5: in which figure, we are to observe, the *retinal image-circles and pins' heads are* *not represented;* but they are always to be *understood as existing unseen on the retina, on opposite sides of its axis* to that on which the SEEN OBJECTS *appear to be situated.*

It will always be recollected that, we no more ever see any tactual visual image in the Optic Trunk, or in the Cerebral Eye, than we see that which is impressed on the retina: Though it is as strictly demonstrable, or rather is already as strictly demonstrated, that such tactual visual images are formed behind the eyes, as it is that the sun's light is distributed on a wall through the medium of a prism. When, therefore, for the mere sake of convenience in reasoning, I all along speak of the *re-crossing, reforming, or rectifying,* of images; it must never be mistaken to mean that a SEEN IMAGE OR VISION is A REALLY-RE-CROSSED, or REFORMED image. And, hence, the seen circle and pin's head, in the case now under consideration, although they appear to be situated on opposite sides of direction to those which dioptrics inform us are occupied by the retinal images, are in no other way connected with, or *correspondents* of, the retinal images, than by their being *mechanically subsequent, and consequent, on* the retinal impressions.

From the exposition now given we perceive that, when we are *within* the distance required, the SEEN PIN'S HEAD appears to us on the *same hand* as it does upon the exposition given by the disproved Principle of our SEEING *External Direction,* namely upon the left hand; And, when we are *beyond* that distance; both the *seen circle* and the *pin's head* are seen on the same hand as that shown by the disproved Principle in question, namely on the *right* hand when the *right-hand hole is stopped.* The real truth is, that the Mind, *in the mere act of vision, having nothing to do with, (because not perceiving)* any thing but the images made up of its own sensations of colors, finds, nevertheless, that the *relative site of each of these sensation-images,* with respect to the co-existent sensation-images among which it is situated, *corresponds* with the direction of the external object which occasions it; so that, if a retinal image of that object be on the *left of the eye's axis,* the consequent produced *sensation-image* will appear *on the right in the percipient mind.*

Thus it happens that, while Drs. Reid and Potterfield, from an experiment on a *single* pin-hole, which, being moved over the pupil of the eye, causes an external pin's head to appear to move always in a *direction opposite, although* the rays of light from the pin "*do not cross* as in ordinary vision," thought that this fact establishes their Principle of Perpendicularity; it appears from the present exposition, on whose truth I shall insist in stating the future demonstrations of the subject, that the *retinal image,* though it is formed by rays that have not crossed, *is utterly excluded from the ultimate or proper Visual process* by the *production of ultimate and erected sensation-images in the mind:* And, what those Writers held to be a SEEING *of the real pin in a certain* EXTERNAL DIRECTION, is purely a seeing of a *sensation-image* of the pin in a certain SITE *in a sensation-circle in our own mind.* Upon which, it is only farther requisite to observe that, EACH ASSUMPTION, ALIKE, makes the external pin to appear in one *same direction;* and all that we are concerned in, in this place, is the momentous fact of what, for the sake of convenience, is here called the *re-crossing and rectifying of images behind the Single Eye.*

In order, however, to prevent the caution, now given with regard to the phraseology in question, from carrying a reader into an error on the opposite side; I observe that, we *must assume a real re-crossing of rays, or lines, of something;* whether they be supposed to be those of *Light,* under any modification of its substance; or, the "*Materia Subtilis*" of Newton; or, the *Galvanic Principle;* or whatever other Agent; UNLESS Light, or the supposed Agent, be supposed to operate by UNDULATIONS, propagated along the nerves: in the last of which cases, the *crossing will not be actual or real;* although a *change of result from one side to the other* will equally be the consequence. Therefore, we are not warranted to assume an *actual* re-crossing: And, even, if this were assumed; we are, above all, to distinguish that this could not be a re-crossing IN THE EYE; and, therefore, we are to note that, the *black-line objects represented in the Diagrams are fallacious representations* in so far as regards their *apparent site,* since the *seen* images of things are in the perceiving mind alone.

In case it might otherwise be thought that the DIAGRAM, *Fig.* 3. affords not a true, or conclusive proof of the *crossing of the two retinal circles;* I observe that *Fig.* 3. is made from the *actual fact* that, when a pin's head is about two inches from the eye, the *external circles*, seen through the two pin-holes, are each of the *exact size of a Sixpence*, as is depicted in the *two dotted circles*, one on each side of the pin's head. Now it is self-evident that, if these two dotted circles, instead of being *in contact*, or a *little intersected as they are drawn*, were drawn *asunder;* the *more they are asunder, the more the retinal circles they occasion on the eye must cross, and actually separate:* which fact proves that they *have crossed*, as in the Figure; though *not wholly so.*

### PROPOSITION 22.

*In* ANY *case of Vision with a* SINGLE EYE, *the* OCULAR *Image of the Object is re-crossed after its* INVERTED FORMATION ON THE RETINA, AND IS REFORMED AND MADE ERECT POSTERIOR TO THAT EYE; *and this rectified image is a* TACTUAL VISUAL *image formed in the* THIRD OR CEREBRAL EYE; *from the discharging of which last, upon the perceiving mind, we consequently have* ERECT VISION *consisting in the* SENSATIONS OF COLORS *which it occasions.*

PROOFS.—In the proofs of this Proposition we shall, as I have already intimated, have no essential demand for the employment of any means other than the naked eye; Although the use of glasses, and sometimes of pin-holes in a card, will be found very conducive to our case, and to clearness in the experiments: And, indeed, for the reasons last mentioned, I shall begin the account of these experiments with such means; and shall only in the end call the attention of readers to the fact that the requisite general results may be had from the use of the eye alone. The experiments, to be here described, may be divided into various classes: because, we may try a variety of them by the same means, and in the same general circumstances; one only of which, for most part, I propose to describe in each class.

### *Experiments of the First Class.*

As a preparatory experiment, to others that are to follow; If we look at a window in a room, with a Single Eye; and, at the same time, if we hold a concave lens (such as that of a common opera-glass) with its *middle* before the eye; this refracting medium will throw a *diminished image* of the window, seen through the lens, upon the *large image* of the same window seen through the naked eye. Now, this phenomenon is precisely of the same kind with that of One visual image thrown upon Another, when we look with two eyes through two eye-tubes, at the end of each of which tubes there is outlined an object, upon a cap fitted for that purpose. And, from the laws of dioptrics, we know that the cause, in the present case, is that the rays of light, which pass through the concave lens, are reflected so as to fall upon the retina on the field of the large image occasioned by the window in the naked eye, on which large image the diminished image is seen, as being co-incident.

With regard, now, to the fact of the re-crossing and rectifying of the inverted retinal images; if the window have any particular mark on any part of it, to serve as a guide and test of the fact; and, *if the images were not re-crossed and rectified* after their inverted existence on the retina; we must see the two images (one upon the other) in a *reversed position* to the position of the real external window: but this we shall not see; and, therefore, the images ARE re-crossed and rectified.

### *Experiments of the Second Class.*

If, in the case already supposed, we hold the concave lens, not with its middle, but with its *edge* upon the eye,—namely—with *its right edge* upon the *left side of the eye;* and if we look at the window so as to see it through the lens, and also through the other parts of the pupil of the naked eye, moving the lens as may be found requisite; we shall, then, see the window extending on each side of the axis of naked vision, because its image in the naked eye falls on each side of the axis; and we shall also see a *diminished window on the left* side of the former, because the lens has converged the rays of light, and has caused a small image of the external window to fall on *the right* side of the image on the naked eye.

Now the reason why the SEEN *diminished image is on the* LEFT side of the *large image*, while the RETINAL *diminished* image is impressed upon the RIGHT *side*, is that it *has been re-crossed over*, or which is to the same amount and is the strict truth, it is a *newly-produced image in the mind*, *mediately* *consequent upon the primary inverted image on the retina.*

And, as for the proof of the fact of the images being *thus rectified*, as well as re-crossed ; it is certain that, if they had not been so, the lesser image must be seen with its *back* to the large image, that is with that side next it which, (it may be proved from any external mark,) is *farthest from* that edge of the real window with which it *now appears to be in contact*. Thus, the two *seen* images, instead of appearing according to the external window represented by *Fig*. 9. would appear with the lesser image on the *contrary side* of the larger to that on which it is actually exhibited ; and, with its marked edge in contact with the edge of the larger, which is contrary to what we witness.

### *Experiments of the Third Class.*

The Two Classes of Experiments, already described, exhibit ; THE ONE of them, an object thrown upon the face of another, but this without the fact of their *interlacing* each other :—The OTHER, an object thrown on one side of another, in apparent contact with it, and connected in such an order as could not have happened if the retinal images had not been re-crossed. But there remains, yet to be adduced, the last desideratum on the subject,—namely—the exhibition of *One Object seen interlacing Another*, in a manner similar to that which was exhibited in the case of our employing two eye-tubes, in an experiment of two-eyed vision : And the Class of Phenomena, now to be introduced, affords us this proof.

With regard, now, to the fact of the re-crossing and rectifying of the inverted retinal images; if the window have any particular mark on any part of it, to serve as a guide and test of the fact; and, *if the images were not re-crossed and rectified* after their inverted existence on the retina; we must see the two images (one upon the other) in a *reversed position* to the position of the real external window: but this we shall not see; and, therefore, the images ARE re-crossed and rectified.

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The Phenomena and their results, now under investigation, are perceivable with the naked eye; and they escape ordinary observation only because we seldom look at objects within the distance that suits our eye, in which case alone they are discoverable; and because we are seldom given to philosophize upon them when, by any accident, we are thus situated. The employment of glasses, or of eye-holes, in experimenting upon these phenomena, will be found convenient: but they are by no means essential.

*Experiment First.*—If we look through two pin-holes at a *shilling,* situated about three inches (*the nearer the better*) from the eye; we shall see, *not a circular* object, but an object *acutely oval,* it being pointed at the top and bottom: And this difference of shape, from that of the real external shilling, is occasioned by *a stripe of the middle of the seen shilling's being annihilated,* in consequence of the *retinal image of one half of this stripe being thrown upon the other half* in the eye, by reason that the two halves of the retinal image of the shilling have crossed *only incompletely,* because the humours of the eye have not had power, at so small a distance, to make the two halves cross completely, as they naturally tend to do under the laws of dioptrics.

Accordingly, when we look at the shilling, as above described, and cast our eye upon the numeral figures of its *date;* we shall see, instead of 1815, the figures 815;—or, else, 181;—the 1, or the 5, being lost to our view: And the exposition of this phenomenon is the same as that already given—namely—the rays of light which have occasioned the two halves of the retinal image of the shilling have crossed according to the laws of Dioptrics; but they have not had room to cross altogether, and the small remainders of the two sets of rays that have not crossed have formed a *coincident retinal image upon the centre or axis of the eye:* One half of which image is, of course, *lost to the breadth of the seen shilling;* while the other half tells in the account.

Now, this case is manifestly and exactly similar to that in which, when looking with both eyes through two eye-tubes, we throw the two seen circles, occasioned by the farther ends of the tubes, upon each other; and, by these means, reduce the breadth of the two seen circles to that of one of them. And, by reason of this sort of coincidence, we find in the present case that, while we have lost sight of some of the numerals of the date, the *seen head and neck* of the object is *very considerably narrower* than when we see it from the distance of distinct vision.

But the important fact of the RE-CROSSING of the images, in this case, remains yet to be considered. And the evidence of this fact consists in our observing, in any phenomenon of interlaced vision, that, the INTERLACED FEATURES *do not present themselves in that* REVERSED ORDER, *in which they must have appeared if their images had* NOT *been rectified,*—they always appearing in the same order as that of the features of the *external* object which occasions them: AND, AS THEIR WHOLE APPEARANCE IS AN INTERLACED APPEARANCE; this phenomenon exhibits the most rigorous proof of the fact asserted, that is possible for our reason to conceive. I proceed to the class of phenomena which show this result.

*Experiment Second.*—If, instead of employing holes as in the foregoing experiment, we make use of a concave lens; and if we hold the lens so that we shall see the *head* on the shilling, partly through the lens, and partly with the naked eye; we shall, in this case, see the *head duplicated;* and the *numerals of the date,* at the bottom of the shilling, will also be duplicated, so that, (accordingly as we vary the place of the lens, or the eye,) instead of 1815, we shall see 18,815, or 181,817. By varying the means; the two *seen heads* may be brought with their *profiles nearly to co-incide;* or, else, they may be carried wide of each other, so as *nearly to separate* the two heads altogether: for it will be understood that, the whole process of duplication is caused by the converging power of the lens, which throws the image, occasioned by it on the eye, *either over or beyond* the image occasioned in the naked eye.

And here, in the *First* place, from what has been formerly shown, it is evident that, unless the retinal images had given up their office to reformed and rectified images within the brain; the two seen heads must have appeared to us with the *large one on the right side of the small one,* which is contrary to what we actually see.

*Secondly.*—But the most curious test of the recrossing, in this case, is the *multiplication and alteration produced in the seen arithmetical figures of the date:* Because it is certain that, if the retinal images of these numerals had not been reformed and rectified, the seen numerals *must have been transposed among themselves so as to* CHANGE THE DATE MOST ENORMOUSLY. Thus, the external numerals—18—marked on the shilling, if they had not been re-crossed, must have appeared *on the right* of the numerals 15 :—And, worse than this, it is certain that the external numerals—1815—occasion on the retina the numerals 5181, at the same time that each numeral, in itself, is turned upside down. But we never see any such upside-down exhibition ; nor yet, perceive the preposterous transposition of the seen numerals, forming a monstrous contrast with the external numerals which occasion them. The Science of Arithmetic, therefore, presents a peculiar rigor of test, to show us the fallacy of the Berkeleian Hypothesis that the judgment reverses the sentence of the eyes: For, it is impossible for the most extravagant prejudice to pretend that, the *same eye contradicts itself as to the correlated positions of a number of arithmetical figures, that stand side by side each other at one same moment of time:* And the fact of the re-crossing and rectifying of the images is thus farther confirmed.

*Experiment Third.*—We are now come to that class of phenomena, which affords the ultimate step of demonstration of the fact which we are investigating :—I mean the phenomena, (in the case of Vision with a Single Eye,) of INTERLACED VISION *in the strictest sense of this phrase.*

In order to produce these phenomena in their varieties, a number of means or external objects may be employed. As, for example, the *Black-line Figure* 6, *as it stands in the* PLATE, (without reducing a reader to the trouble of forming objects for the purpose in any other way,) will afford us a very sufficient case of interlaced vision. And, accordingly, if we look at *Fig.* 6, within the distance of five inches; and still better if we are within two inches from it; we shall see, instead of its real external form, which is that of a *leaf, with its stem and ribs distinctly marked for the purpose, the* INTERLACED *form of Fig.* 7; the *seen ribs being duplicated, near the stem, into a lattice.*—If we look at the Figure through a hole in a card; we shall see the interlacing more clearly: but, we can see it, well enough, without any such medium.

Here it is sufficiently manifest, from what has gone before, that the PHENOMENON OF THE INTERLACING is occasioned by the *duplication of the retinal image* caused by the external leaf or figure. And this *interlacing* is only one of the various modifications of that *blurred appearance* which is called *indistinct vision;* which sort of duplication, *as being the cause and nature of indistinct vision*, is known to Optical Writers. But this knowledge has never led any Writer to suspect that, not only are the retinal images duplicated, by the one's crossing the other; but also that, *after this they are re-crossed and reformed behind the eye.* And this is the fact now to be insisted upon; always observing, throughout this work, because it is of vital importance that it should never be misapprehended, that, by the term *re-crossing, reforming,* or *rectifying,* of an image, a *real crossing over of* *any image is never meant;* but it is meant only that, in any case of Single-eyed Vision, an ERECT *cerebral tactual visual image is* PRODUCED, CONSEQUENTLY UPON the previous existence of an *inverted image on the retina;* and that, an ERECT PROPER VISUAL IMAGE *is produced consequently upon this Cerebral Image;* and, lastly that, both the cerebral image and the visual image in the Mind *are formed and appear upon a* CONTRARY SIDE, IN ANY PRESENT *field of vision,* to that side on which the INVERTED RETINAL IMAGE *which occasions it* IS FORMED.

Now, to prove this fact in the present example, we are to observe that there are TWO DIFFERENT AND OPPOSITE ORDERS, in which the crossing and duplication of the image seen according to *Fig.* 7. MIGHT happen: One of which agrees with that of external nature, in the objects without us: And the other contradicts, and violates that order. And we are now called upon to mark the fact that, the duplication which we SEE when looking at *Fig.* 7, is in the SAME ORDER as that of the *external object Fig.* 7. Whereas, if the retinal inverted images had not given way to rectified images, thus seen; it is certain, from the laws of Dioptrics, that the seen object must have been, *not as Fig.* 7; *but, on the contrary, as Fig.* 8 *would appear if its middle stripe were interlaced similarly* to the interlacing of the middle stripe of Fig. 7. And here the reader will critically observe that, the *ribs* of the external leaf, Fig. 6, *point downwards:*—whereas, the ribs of the image which this external leaf occasions on the retina, represented by Fig. 8, *point upwards.* And the certain consequence of this would be, if the images were not rectified behind the eye, that the *order of the two sets* of SEEN ribs, *in their state of interlacing each other,* must be REVERSED from the order of the ribs in the external leaf. But this violation of the order of external nature is not now, nor in any case, ever witnessed; and, therefore, the images are recrossed behind the eye.

*Experiment Fourth.* — Of all the experiments which I have been led to try, in order to exhibit the Phenomenon of Interlaced Vision; there are none that have so beautifully shown the desired result, as those in which are employed two external objects of different and contrasting colors. And among these, perhaps, the reader may find none that will more neatly answer the purpose than two pieces of coin—namely—a *white* and a *yellow* — placed in contact, and moderately inclined from the eye: which may be done by placing the two pieces upon an ink-stand, side by side each other.

If we place a *guinea* and a *shilling* as now described, the *former upon the left* of the *latter, Fig.* 10;—and if we look at them from within the distance of distinct vision, especially the more so if we bring the eye within two inches of them; we shall then see a very notable portion of the *edge of one of these coins interlacing the edge of the other;* and the two contrasted colors—the *white* and the *yellow*—will display, in the most distinct and beautiful manner, the FACT ON WHICH SIDE EACH OF THE SEEN OR SENSATION IMAGES IN REALITY STANDS *in relation to the other, agreeing with Figure* 11.

Such is the vivid impression of decisiveness and conviction of the fact, which this phenomenon calls up in our judgment while we are contemplating the two interlaced sensations of colors, as they appear contrasted in their very tissue;—sometimes *each color appearing distinctly interwoven with the other;* and sometimes, *both being nearly merged in one;* although, *still,* we can discern some *very fine curve lines of each coin* interlacing similar lines of the other; that every other species of the phenomenon of Interlaced Vision seems cast behind, in its claims to equality as a test of the fact: Although, in strict fact, all the phenomena in question are equally conclusive.

If we look at the two coins through two pin-holes in a card; they will show the phenomenon more clearly; and, even, in *a greater extent of interlacing:* at least, I find this to be the case of my own vision; although, to a younger eye, perhaps, the result may be equally extensive and vivid in either case.

After all that has been said before, with regard to the *preposterous order of position* in which the seen images of things must be thrown if they were not re-crossed and rectified behind the eye; I need hardly here point out the dioptrical certainty that, if the seen image of the shilling, and that of the guinea, had not been thus re-crossed and rectified, the SEEN SHILLING MUST HAVE APPEARED ON THE LEFT, *and the* SEEN GUINEA ON

THE RIGHT ; both which are contrary to the order of position of the two real external coins ; while it is also contrary to the order in which we actually see them. At the same time, the *fact of the interlacing* forbids any attempt, even the most extravagant, to pretend that the eye deceives either itself or us, in the exhibition of such a test.

It appears almost superfluous to remark farther, unless for the sake of readers who are not in the subject, that when we are looking at the two coins the *retinal image* of the real external guinea (which guinea is on the *left* in external space) *falls* upon the RIGHT *side of the eye's axis,*—it being crossed over, as well as inverted upon the retina ; and, in like manner, the retinal image of the real shilling (which shilling is on the *right* in external space) falls upon the LEFT side of the eye's axis. If, then, the SEEN INTERLACED IMAGES of these two coins *were not reformed and rectified* images ; they *must have appeared* interlaced the CONTRARY WAY to that which they actually exhibit ; that is to say, the *phenomenon of the interlacing*—WHICH PHENOMENON CANNOT BELIE ITSELF,—*must have belied* EXTERNAL NATURE, *which it does not.*

In closing, as I now do, the proofs of the Subject drawn from the Phenomena of Interlaced Vision ; I hope I may be allowed to affirm that, there is no fact in Dioptrics, or in any department of Optical Science, that is more rigorously demonstrated, than that of the re-crossing and rectifying of images behind the single eye.

resemblance. Which, of these two courses of research, will stand the test of time; is a matter which rests with the public to decide. But, the most remarkable circumstance, which I would here point out to readers, is a fact which must speak for itself—namely—that Dr. Reid's "INQUIRY" has been held up, by his Successors, as a "MODEL OF PHILOSOPHISING:" While, *all attempts to speculate either way* as to whether, or not, the Mind or its Sensations are "*extended or inextended*," have, by the same authority, been *expressly excluded from all legitimate inquiry*, as being to the last degree UNPHILOSOPHICAL IN THEIR VERY NAME. Assuredly, men of reflection, who are in this department of knowledge, must be roused to attention by a manifestation of inconsistency so glaring,—so confidently advanced,—and so arbitrarily inflicted upon whatever understanding it may find in a state to receive it. But, as concerning the subject of the present inquiry; I proceed, now, to advert to the manner in which I had considered the phenomena of Vision excited by pressure, in the work to which I have alluded: And I do this for the purpose of pointing out, in the sequel of the Section, the remarkable harmony which subsists between the facts in question and the views of Sir Isaac Newton with regard to Vision, and to the NATURE OF MIND. At the same time, it is proper to add that, I supply the following extracts only because the volume, of which they make a part, is out of print; and because, although I suppose it contains a mass of facts on the extent, the laws of these appearances: While I at the same time intimate that, the Phenomena in question involve very unexpected and considerable consequences, in the light which they throw upon the fact of the re-crossing of visual images; over and above the important consideration that their existence and manner of excitement bear very seriously upon the SCIENCE OF MIND.

In the earliest of my publications on the Phenomena of Mind,* I entered largely into a consideration of the process of thought in the case of the *Five External Senses,* treated respectively.—And, while the work in question had its origin at a period of nearly thirty years back, in a country and circumstances wherein, with hardly an exception, I had no access either to the writings of philosophers or to the converse of men acquainted with such matters; it happened, by an accidental co-incidence, that my research was, in its general character, of the *same nature* as that which had been instituted by Dr. Reid, in his "INQUIRY INTO THE MIND;" that is to say, it was an *inductive inquiry, in order to ascertain the fact, whether or not our* SENSATIONS, *and consequently our* IDEAS OF SENSATION, *are* EXTENDED RESEMBLANCES *of the external objects which excite them.* It is sufficiently known that all Dr. Reid's experiments, and conclusions, have turned on the side of DENYING any such resemblance:—While the whole of mine have led me, all these years, to insist on *affirming* a

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* An Essay on Consciousness.

# SECTION FIFTH.

## OF VISION WITHOUT EXTERNAL OBJECTS.

### *Introduction.*

In the course of treating the Fourth Mode of Vision, I had occasion to show, in a Proposition appropriated to that purpose, that we have a distinct proof of the re-crossing and rectifying of Visual Images from the Phenomena called ACCIDENTAL COLORS. These phenomena, it is sufficiently known, are occasioned by the presence, *in the first instance,* of external objects; but which objects are removed from our field of vision before the correspondent colors arise in the mind, consequent on the impression in the eye previously made. But there is yet another class of Visual Phenomena; which, owing to the *manner and nature of their exciting cause,* claim to be considered as being of a *Different Species* from any of those that have been treated in the foregoing Sections; or, at least, the production of which must be regarded as constituting a *Different General Case of Vision.* The Appearances, to which I now allude, are those which arise in the Mind when, at any time, the Eye is subjected to any considerable blow, or pressure: an accident which may happen in various ways. And I here announce that I propose to investigate, to a certain extent, the laws of these appearances: While I at the same time intimate that, the Phenomena in question involve very unexpected and considerable consequences, in the light which they throw upon the fact of the re-crossing of visual images; over and above the important consideration that their existence and manner of excitement bear very seriously upon the SCIENCE OF MIND.

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* An Essay on Consciousness.

In, and near, *page* 232 of the work, I have expressed what follows:——" If the eyes be covered lightly, we have a total absence of vision: But, if we begin to *press* with the hand, *gently*, we shall then have a *beginning sensation of faint light*, not in a uniform surface, but a surface consisting of UNDULATIONS; and, as we gradually increase the pressure, these *Undulations* will gradually increase, both in *size* and in *brightness*, until, by the time the pressure amounts to pain, the luminous undulations will equal the lustre of the sun itself."

" Colour is physically occasioned by small nervous motions, with consequent Undulations in the Surface of the Mind, taking naturally proportionate times."

" The fiery undulations produced by pressure on the eye, (at any given degree of pressure,) are not either circles, or squares, or triangles, or of any other definite shape; but they are *nevertheless undulations*, possessing peculiar shapes, and constituting a *surface of mottled light:* and I believe it is impossible, by pressure, to produce *undulations small enough* to appear as a surface of uniform light."

" It is of importance here to consider the fact that, when we have pressed the eye to a considerable degree of pain, and have produced *large* Undulations of the *brightest possible* light; we may contemplate these Undulations as belonging to the sense of VISION; and, otherwise, as belonging to the sense of TOUCH."

"If we contemplate the fact, of *one motion's* producing *two such different sensations* as *Colour* and *Touch;* it manifests such a connexion between *Feelings of the Different Senses;* and, opens such a view of the *conscious* and *physical* operations of the Mind; as, I am obliged to think, strongly evinces a physical connexion between it and our body."

"If we observe a surface of water, with large undulations raised by the wind; and if, at the same time, there be *very fine rain;* we shall perceive *little delicate undulations,* raised by the rain, playing in undisturbed repetition upon the *bosoms of the large waves.*—In a similar way; it may be possible for *Visual undulations* to occupy the very same position on the mind's surface, that is occupied, synchronously, by *gross undulations of the Sense of Touch.*"

The extracts, now given, are taken nearly in the consecutive order of the original. But, on account of the bearing of the work upon the present subject; and, in order to show its agreement with the Newtonian views concerning Vision within the Mind; I add the following extracts, from different parts of it.—"If we observe a surface of standing water, during small rain; we shall perceive a surface of little circles that *rise distinctly, then blend and die:* which process may somewhat resemble the tendency to blend amongst *synchronous sounds;* thereby producing, less or more, *confusion in hearing:* Or, if the rain be hea impulses may rather indicate the greater tendency which *synchronous Tastes* have to blend, and to confound each other—Again; if we observe water during rain of the *finest possible degree;* we shall perceive a surface covered with *delicately beautiful minute circles,* which *rise, and die, without blending,*—their *sizes not enabling them* to invade their next neighbours. These last I suppose to resemble, rudely, the *manner of visual undulations:* and their minuteness is the reason why they die without reaching farther than a *mere contact* with those around them."—"This repetition being rapidly kept up; each succeeding surface of waves shall be strictly similar to the preceding set, so long as the sensible object affects the eye; and we shall have a *continuous sensation of one color* therefrom."

The last consideration which I shall advert to here, as suggested in the work in question, is the supposition that, the *reason why we can entertain sensations of Sight in a much greater rapidity of succession,* than we can entertain sensations of Hearing, (the difference being about double in the number of succeeding sensations,) is the *difference in the sizes,* respectively, of the *undulations* of each sense; by reason of which, those of HEARING take about *double the time to rise and fall, so as to give place to their successors,* that is required by sensations of SIGHT.

How far these views are in harmony with those advanced by Sir Isaac Newton, I hardly need point out to any philosophical reader: While, at the same time, I may appeal to the general tenor of my own speculations, as a test whether I appear to have been biassed, in the course of them, by an undue admiration of the genius of Newton, any more than by that of any lesser Philosopher. But, although here altogether disowning any such bias; I cannot do other than feel, and I cannot refrain from expressing this feeling, that I reflect with very peculiar satisfaction upon finding that the tenor of my own course has led me, even to the ultimate stage of speculation in the present essay, to results which in fact amount to ONE SAME VIEW OF THE NATURE OF MIND with that entertained by Newton. Most certainly, I never, at any time, had the smallest inclination, either to wrong the intentions, or to undervalue the endowments, of those Writers who have held up the Pneumatological creed of Newton as a beacon of error, in estimating it as no better than the visionary conceit of a philosophical age in reality barbarous when compared with that era which themselves have introduced. But, the longer I prosecute any speculation on the subject, the more I am filled with astonishment that it has been possible, that any sound understanding, which has been in earnest with regard to it, could so misinterpret whole series of proofs; and so refuse the impression of a host of others, which admit of no misinterpretation; as has been done in the writings of the opponents of Newton on the ground in question. But, I proceed to another consideration.

When we consider the view entertained by Newton of the nature of our Sensations; it may, at first sight, appear surprising that we find no account taken by him of that Species of Vision which is produced without an External Object.—The only notice concerning any such Vision expressed by him, is in regard to the phenomenon which, he says, resembles a *peacock's feather:* Which phenomenon he mentions so very briefly, and so voidly of any supposition of its involving *any consequence* in philosophy; that I shall be under the necessity to remark upon this, his omission, farther on. But our surprise may cease with regard to this when we recollect that, neither Locke nor Newton could ever have anticipated, that a time would come when the extension of our sensations would be denied; and a new Scheme of Pneumatology be erected upon this denial. The reader will remember, with regard to the *History* of the subject, that, (it has been expressly acknowledged by Professor Stewart,) the *first suspicion suggested* against the extension of our sensations was that which consisted (to use the words of Mr. Stewart) in the "*criticism which Dr. Hutcheson had stumbled upon:*"—the merits of which criticism I have sufficiently considered in other places, and need not dwell upon here. After so decided an exposition of the *time,* as well as of the *manner,* of the origin of the Reideian School; we cannot be surprised that neither Locke nor Newton ever concerned himself about bringing *proofs* of the reality of the extended modifications of our mind; which, no philosopher, from the beginning of recorded speculation, had ever thought of calling in question. For this reason, I have on a former occasion supposed it was that, the Laws of the Interlimitation of our Sensations of Colors, (which are the Constituent Elements of Visible Outline or Figure,) never occurred to the mind of Locke; although, they might readily have occurred to that of a Sign Painter, if he had been *speculatively* interested in the fact.

As a *recognition of fact in the History of our Sensations*, therefore, it is a very valuable recognition that has been left by Professor Stewart, that Dr. Hutcheson's indefinite conception of the matter was the *firs* note of dissent raised against the fact of the extension of our mental modifications;—valuable, I say, if those who are interested in the subject will only duly profit by it, and by its attendant circumstances in the fabrication of the Reideian Theory; both which, I have sufficiently pointed out in my other writings.

It remains, that I proceed to the Propositions to be discussed in this Section.

### PROPOSITION 23.

THE FACT OF THE RE-CROSSING AND RECTIFYING *of Visual Images behind the* SINGLE EYE, *in the case of Vision with that Eye, is farther and collaterally demonstrated, (beyond the Proofs adduced in the foregoing Sections,) by the Phenomena of Visual Objects perceived by us in consequence of employing Pressure upon the Eye* WHEN THERE ARE NO EXTERNAL FIGURED OBJECTS *either existing, or* SUPPOSED BY US *as existing, to which the Objects perceived can be referred as their cause.*

PROOFS AND ILLUSTRATIONS.—The last query left by Sir Isaac Newton, at the end of his OPTICS, is of the following tenor:—"When a man "in the dark presses either corner of his eye "with his finger, and turns his eye away from his "finger, he will see a circle of colours like those "in the feather of a peacock's tail. Do not these "colours arise from such motions excited in the "bottom of the eye by the pressure of the finger, "as at other times are excited there by light for "causing vision? And, when a man from a stroke "on his eye sees a flash of light: Are not the like "motions excited in the *retina* by the stroke?"

Now, notwithstanding what I have said in the introductory remarks to this Section, it appears very surprising that the mind of Newton should not have been called, by the Phenomenon in question, to any greater extent of research, than that which is manifested by the query he has thus left with regard to it. And this is the more so when we consider that it appears, from certain manuscript papers of this great man, obtained by Mr. Harris and published among the Notes to Optics of the latter, that Newton had occupied himself considerably in an *Anatomical* inquiry with regard to the probable *manner, and ultimate seat* of Vision; insomuch that, the query which he has left with regard to the manner of Cerebral Vision is by no means a solitary conjecture formed without previous speculation. But, however curious it may be, that the phenomenon of the peacock's feather should have remained a sterile fact in the eyes of so great a Philosopher; and, that it has shared the same fate in the estimation of Dr. Potterfield, who came after Newton and who adverts to this phenomenon in words that are the mere echo of what Newton has uttered with regard to it;* while, also, I find no notice at all concerning it in other Writers on Optics; I confidently apprehend it is a fact pregnant with very extraordinary results, in throwing light upon the manner of Cerebral Vision; and this, in an extent beyond what can be affected by any of the phenomena of the Vision of External Objects.

In the *First* place, therefore, I have to observe, generally, that, in the experiments employed in the Subject, it is so far from being requisite either to *turn away the eye from the finger*; or, yet, to experiment in the *dark*; that, in general, the position of the eye, or pupil, is *never altered*; and, what is still more remarkable, the peacock's feather always appears the *most rich, vivid, and prominent, when the eye is open toward a strong light*,—facts which prove to what a degree this class of phenomena has been neglected, or rather overlooked, by inquirers on Vision.

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* Dr. Potterfield, *Book 5, chap.* 4, says:—" It is from this " principle that, when a man in the dark rubs the under part, " or either corner of the eye, with his finger, and turns his eye " away from his finger, he will see toward the opposite side of " the eye a circle of fiery colours, like those in the feather of a " peacock's tail."

This Phenomenon, moreover, he accounts for, almost word for word, as Newton has done. And the *only utility* which he suggests, concerning it, is that it may serve, in the case of a person afflicted with a cataract, to show whether, or not, the optic nerve is paralytic.

*Secondly.*—I may at once proceed to describe the experiments, which furnish us with the proofs of the re-crossing and rectifying of the retinal image formed in the eye, upon pressure of that eye.

The most convenient instrument that I have found, for the purpose of pressure, is the head of a pin. And, if such an instrument be steadily pressed; and, still better, if it be pressed by *throbbing or continued impulsions;* upon any side of the eye, whether the eye be closed or open, and whether it be in the dark or in the light, but better if in the light and the eye be open; we shall always see a colored spot, *apparently on the* OPPOSITE *side of the eye to that of the pressure;* the *size* of which spot will be *correspondent to the degree of pressure, or, to the size of the pressing instrument;* and the *character* of which will be that of *several concentric circles, having usually a black ground, with a greenish fiery margin;* and, when the pressure is *much, a spot of white,* with a *small black spot in its centre,* will appear in the middle of the field.

Now it is too obvious from what has gone before, to require any proof here, that the cause of the Phenomenon's being SEEN ON THE OPPOSITE side of the eye, to that on which the pressure is made, is a re-crossing of the retinal image behind the eye. And while it may be proved, by performing the experiment before a mirror with the eye open, that *in general the pupil does not move,* and that, therefore, the seen object is *not occasioned by the pupil;* we have a conclusive proof, in the *fact of the correspondence of the size of* the seen object with the *degree* of pressure, that this object is *occasioned by the pressing instrument*. The fact plainly is that, while the *gross* object is occasioned by *depression or flexure, to a certain small extent*, of the *sclerotic coat and nervous lining of the eye;* the white circular spot in the centre, with the black spot in the middle of it, is caused by the *immediate and narrower* pressure of the *pin's head:* And thus, the whole phenomenon is simply explained when we have affirmed that, the SEEN *image appears on the opposite* side of the eye in consequence of a change, or re-production posterior to its retinal existence; *which retinal existence is certainly on no other part or side of the eye than the* PART OR SIDE IMPRESSED.

In farther proof of the fact now under consideration; I observe that, if we move the pressing instrument with a circular progress all round the pupil of the eye, on the region about midway between the pupil and the bottom of the eye; the seen image, which will appear on the opposite side of the pupil, will move round in correspondence with the motion of the instrument,—always preserving an opposite position to that of the points of pressure.

The correspondence of *motion*, and that of *opposite position*, of the seen image, as just described; and the two afore-mentioned correspondences—namely—that of the *size*, and that of the *vividness*, of the seen image, in proportion to the size and degree of pressure of the instrument employed; constitute, together, a complete demonstration of the two important facts—that the seen image is *caused by the pressure* in question, and that it is in the sense of the phrase all along employed in this essay a RE-CROSSED image, that is a SEEN image on the *opposite site of our field of Vision* to that on which the pressure is made on the *retina.* Now, therefore, we have only to seek for the *manner in which this crossing, or this* NEW PRODUCTION RATHER, *is effected posterior to the eye,* in its various stages,—namely—first in the Optic Trunk; and, afterwards, in the Cerebral Eye, previously to its ultimate discharge on the perceiving mind.

But, before we proceed to this, it appears proper to entertain that fact which will be the subject of the next set proposition.

## PROPOSITION 24.

THE FIGURES *of Objects, perceived by* SIGHT, *are of* ONE SAME GENUS *with the Figures of Objects perceivcd by* TOUCH.

The attempt of Bishop Berkeley, to show that Visual Figure is not of one same genus with Tangible Figure, was equally fallacious and mischievous in its consequence of tending to mislead the understanding. It was justly condemned by Dr. Reid. And its fallacy is rigorously proved by the Phenomena of Visual Figures perceived in consequence of pressure on the eye. The correspondence of *size,* of the seen object, to the size of the pressing instrument, or to the *degree* of its pressure, is a decisive evidence of the fact: While, also, we at the same time *feel* the sensations of the two different senses—namely—of *Sight* and of *Touch*—at ONE SAME TIME; and can contemplate, *distinctly*, each of their specific characters.

Here it is requisite to be observed that, the *proportion, as to size* of the visual object, can only be perceived up to a certain degree of pressure. Thus, if we begin to press, or throb gently, with any pointed instrument; the correspondent seen object will be very small, and faint in its colors: and its size, and vividness, will increase up to a certain degree of pressure. But, as perhaps the eye will bear no greater depth of *flexure*, than that now supposed; we shall not find the seen object augment beyond a certain magnitude. But the results, which we obtain, are nevertheless altogether satisfactory with respect to the cause of the general phenomenon.

In a word; The Phenomena perceived from pressure on the eyes demonstrate, conclusively, the fact that VISION *is only a finer Species of* TOUCH, as was believed by the Philosophers of the earliest times. And no visionary speculation can ever, hereafter, carry us away from this proof of the nature of mind.

It was on this general fact that I insisted, at large, in the work already alluded to. But, at that early stage of my speculation on the subject, the arguments and evidences adduced were of a far less definite character than those that are now advanced, including the laws of our Sensations of Colors as stated in the Eighth Proposition.

The ways to the arcana of nature appear often very narrow; and, at first sight, seem to lead to nothing. But, when once we have gained the clue, by having been brought into a right train of thinking on the phenomena, we are led, by care, from one step to another, until at length an unexpected result breaks in upon us. The Phenomenon which Newton has described, under the name of the peacock's feather, is one of that class which requires, with the strictest propriety, to be designated as being VISION WITHOUT EXTERNAL OBJECTS, since the SEEN IMAGES which we undergo, in any such case, have NO PROTOTYPE *in the figured things of the external world;* although, they certainly have a physical cause external to the mind. And here, the distinction of the two causes is a very material consideration: because, in the case of Vision excited by an external object, and of this vision's being continued after the removal of such object, it might be feigned, however groundlessly, that the seen image is *some relict of the excited nervous action; or, some imagination from memory* excited by the object that is removed: but, in the case of Vision without any excitement from such an object at all, there can be no pretence left, even for the most prejudiced person, to reason in this manner.

The undeniable fact, in the case of Vision from pressure, is that the EXTERNAL WORLD IS SHUT OUT, *from all supposition of its interference with the* MODIFICATIONS WHICH THE PERCEIVING MIND UNDERGOES: And we now find ourselves a Spectator in the *World of our own Sensations, ex-*

*clusively;* concerning the nature and relations of which sensations, among themselves, we can reason without any thought of their exciting causes.

And here I would call particular attention to the remarkable CHANGE which takes place in the mind, (that is in the *understanding and cast of reflection,*) which we fall into on finding ourselves in this situation. With regard to the state of my own mind, at least, when I am contemplating the various phenomena of Vision without External Objects; (which phenomena I shall presently show to be perceivable with *both eyes acting in concert;*) I, for the moment, lose all recollection of *externality, and of cause whatever;* and I contemplate *only several of my own Mental Modifications, in their various colors, shapes, relative magnitudes, and apparent motions:* while I am aware that the *motions are not real, but only apparent,* since a sensation can *no more move from place to place* on the surface of the mind, than a *wave* of a proportionate size can move, *beyond its law,* on a surface of water.

In the case which I am now describing, VISION IS NOT A LANGUAGE: for it is a Modification of our Mind, consisting in an actual finer *Touch;* and, therefore, it admits of *no interpretation,* or of being considered as a *Sign* of any thing beyond what it is in itself. And, indeed, the same momentous truth holds in the case of ALL PRIMARY VISION WITHOUT EXCEPTION: While, nothing could be more injurious to Pneumatological Science, than a continuation of the assumption of Philosophers that VISION ITSELF *is a* LANGUAGE. At the same time, it is all along to be admitted that

*Secondary Vision,* as far as it can claim the *Name of Vision,* IS a Language; though this is the *sole ground* on which it can ever be affirmed that Vision is a Language at all. I have repeatedly pointed out this important consideration, in other places: and I trust its truth must appear conclusively on the present occasion.

### PROPOSITION 25.

*The Phenomena of Visual Objects, produced by pressure upon* BOTH EYES ACTING IN CONCERT, *demonstrate, by the exhibition of Extraordinary Correspondences, the re-crossing of Images behind both eyes.*

The Phenomena of Visual Objects, perceived from pressure on every side of a Single Eye, demonstrate, as we have seen, the fact of the re-crossing of Visual Images behind that eye. But, in respect to their importance in the subject, these phenomena are far exceeded by the very extraordinary correspondences exhibited between the results of pressure upon both eyes acting in concert; to which, the former serve only as an introduction, or preparatory step.

The limits which I am under necessity to prescribe to the present publication, however, will only admit of my describing the more prominent phases, and correspondences, of the phenomena now suggested,—leaving their farther investigation, or its publication, for a future opportunity. The matter to be here introduced will nevertheless, I trust, be admitted to be of sufficient importance when I intimate that, its Principal Point consists in the fact of a manifest correspondence between Visual Images, produced by pressure of both eyes, IN AN INTERCHANGE OF THE POSITIONS *of the co-existent seen images;* and, by *certain regulated relations of the varying of the* SEEN DISTANCES *between them;*—both facts, together, demonstrating, conclusively, that these correspondences take place POSTERIOR TO THE EYES; *and, that they do so in result of a System of Cerebral Mechanism purposely contrived for this end:* Which result, I think, may fairly be viewed as forming a DATUM, from which we may be enabled to reason, with more or less precision, upon the *manner*, and the *seat*, of the ultimate visual process.*

Having intimated what is now adverted to; I proceed to describe the phenomena, in such of their varieties and relations as appear to claim our earliest attention.

1.—If we press, or throb continuously, with the head of a pin, on the INNER side of each *closed* eye at the same time; we shall see two of the usual sort of Circular Objects, ONE of them apparently in the OUTER corner of each eye: And the *apparent distance between* the two objects will be about *three inches, or more, taken at a medium.*

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* As the final, or farther, prosecution of the subject, beyond what I intend here to state, must of necessity bring the inquirer, in great part, upon ANATOMICAL Ground: And, as it is impossible for me, at this time, to continue the mental exertion requisite to do justice either to the investigation, or to myself: I can only say that, in the case of my supplying, at any time, an additional Section, I shall order such a number of copies of it, *singly*, to be set apart, as may prevent the possessors of this from being sufferers; provided only that timely application be made after it is announced.

2.—If we proceed to operate upon the OUTER side of each closed eye at the same time; we shall see the two usual Objects, *each* of them *apparently in the inner* corner of its respective eye: And the apparent distance between them will be about *half of the former* distance—namely—*about an inch and a half;* though this distance, as will be hereafter noticed, will vary with a variation of the parts of the eyes impressed.

3.—If we impress the *upper* part of *one* closed eye, and the *lower* part of the *other* at the same time; the correspondent image in the *lower* part of the *first*-mentioned eye, and that in the *upper* part of the *last*-mentioned, will appear to be *about as far from each other* as in the case of pressure upon the outer side of each closed eye—namely—*about an inch and a half in point of height;* though the one will *not be perpendicular* to the other.

Upon this last-mentioned general fact, I remark that, my attention has been repeatedly drawn to observe that the VERTICAL LINE OF OUR FIELD OF VISION *is of a much more limited extent,* than the HORIZONTAL LINE OF THAT FIELD. At the same time; this is what ought to be, from all that has been advanced concerning the *correspondence* of Visual Images; and, also, from the *number and arrangement of the eyes,* both which, together, must take in a greater extent of horizontal view, than either eye, singly, can embrace of a vertical view. This remark, therefore, confirms the fact that our two eyes were made for two distinct co-existent fields of vision.

4.—But the most remarkable fact, in the phenomena now described, is that, in the case wherein we operate upon the *outer* side of each closed eye at the same time; and when, in consequence of this, we see each object as it were in the *opposite and inner corner of the* EYE THAT IS IMPRESSED; if we move the pressing instruments in *contrary directions,* we shall now see that the object occasioned by the *pressure on the* RIGHT *eye is* ON THE LEFT SIDE of the object occasioned by the *pressure on the* LEFT *eye;* that is to say, the SEEN OBJECTS ARE INTERCHANGED *as to their correlative positions,* or, in other words, THEY OCCUPY DIFFERENT VISUAL SITES in the perceiving mind, from what would seem to correspond with the eye whose pressure has occasioned them.

Here then, I say, is exhibited, in the most extraordinary manner, a crucial test of the existence of that Cerebral Visual Mechanism for the re-crossing of Images, which has before been demonstrated in so many ways in the foregoing Propositions.

What can be added, here, to the suggestion now advanced, can only regard some details, and illustrations, of the phenomena in question. But the Principal Fact itself is one which, I trust, cannot be contemplated without the greatest cause of satisfaction that our Visual Constitution is in reality such, as has been all along herein asserted. And, hence, there cannot remain a doubt, but the Visual Organ,

which I have asserted as performing the office of a Third Eye, is really existent; and is the actual seat of the re-crossing (by which is strictly meant the new production) of the latest Tactual Visual Images, preparatory to their ultimate discharge on the mind.

Such appears to be the nature and extent of the matter now suggested, in its probable bearings upon the farther steps, (whether followed out by me, or by others,) of the investigation of Cerebral Vision; that, in order to its due illustration, I have supplied a PLATE, with Figures representing the various principal phases of the phenomena.

And, in the *First* place;—By *Fig.* 1, we see represented the several appearances displayed in the case here immediately to be described.—When pressure is made on the OUTER side of either *single eye,* and when this eye is open; we shall see the *usual circular object apparently on the opposite side* of the eye; and this object will *appear at* A P, as if it were on the *outside of the eye and touching the nose.* By carrying the pressure farther back on the eye; we can force the object to appear as if it were *thrust forward* in the situation of F, *or all round beyond the eye:*—but this last is a case not within our present investigation.

But, when the pressure is made on the *outer side of each* CLOSED *eye and at the same time;* (as was described farther back in article second;) we shall, in this case, lose sight of the fallacious appearance AS TO SITE OR POSITION of the seen object of each eye: and, if we now vary the pressure, by contrary motions of the two pressing instruments;

we shall find, to our great surprise and admiration, that the object seen by the LEFT eye is on the RIGHT-HAND SIDE of the object seen by the RIGHT eye,—the two objects, in their respective sites, being now situated as represented by R P.—R P.—indicative of their *Real Places*. Upon which wonderful display I shall comment, after describing the other phenomena in question.

When the pressure is made on the *inner side of each eye at the same time;* the usual objects will appear on the corresponding opposite sites represented by E and E, indicative of the *extremes of distance*, and of the relative situations, of this sort of object produceable by pressure on the eyes. And here I have to observe that, *Fig.* 1. represents the *actual tangible distance between the pupils of the eyes themselves, nearly to the truth of nature,* (in my own case at least,) it being rather more than *two inches and a half:* While, also, the *magnitudes of*, and the *apparent distances between,* the seen objects; (which I have placed behind the eyes, as being TOWARDS their *real* places, though *they appear as if* IN the eyes;) are nearly equal to those that are actually marked in the figure: and there seems to be little doubt, but these visual magnitudes, and distances, are nearly the same as the tactual.

*Secondly.*—By *Fig.* 2. are represented the two usual objects which appear when we press the *upper* part of one eye, and the *lower* part of the other at the same time. The apparent distance, *in point of mere height,* between the two objects, being about *an inch and a half.* But it is to be remarked, here: and the remark is equally applicable as an explanation of our deception with regard to the site of the usual object when we see it *apparently on the side of the nose,* as in the case formerly described; that *the eye can be no judge of the* ACTUAL SITE of any SINGLE object, because it is *no judge of the distance of that object from itself.* But, contrary to this, the eye is, comparatively speaking, an *accurate judge of the actual sites of* ANY TWO SEEN OBJECTS which occupy *certain positions in correlation to each other,* as is the case of the two objects represented by R P. and R P. *Fig.* 1; and, is also, the case of the objects represented by E and E.

In order to illustrate what I have last said; I observe that, when we press on the outer side of the *left* eye, and the eye is kept open; the *part of the retina* that is impressed from without, is the *same part* that is impressed from within the eye by rays of light from the top of our nose. And the consequence of this is that, the outer pressure being the more effectual, we see the re-crossed image of the *peacock's feather* obscuring that part of our nose upon which it appears to ride; and see only that part of our nose which *appears round the feather:* both which appearances, we know, are in the mind itself. But, in this case, we are misled by our *previous knowledge of the real place of our nose;* that is to say, as the peacock's feather appears upon the nose, we are deceived into a belief that its real place is *not farther to the right than the middle of our possible field of vision.* And it is only when we see a *second and correspondent* peacock's feather, whose place we can compare with it, that we become undeceived as to its real site.

*Thirdly.*—By Fig. 3, are represented the other principal phases of that extraordinary phenomenon—the re-crossed objects seen in consequence of varying the modifications of the pressure upon both eyes acting in concert. And here we have to contemplate the appearances immediately to be described.

*First.*—When we press upon the *upper* part of each eye, ANY WHERE ON THE INNER SIDE OF EACH PUPIL; (always observing that a pressure by *continuous lively impulsions*, or, as steady pressure if at the same time we *wink the closed eyes*, is the most effectual,) we shall observe that the correspondent objects produced are occasioned, *each one of them by its own eye:* Which fact, *not being a fact of re-crossing*, does not require a Figure for illustration.

*Secondly.*—When we press upon the *upper* part of each eye, upon correspondent parts of the eyes *about half way between the pupil and the extreme outside of each eye;* we may observe, from moving the pressing instruments up and down in contrary directions, that the object seen with the RIGHT eye has *crossed over or changed its place horizontally*, so that it now stands on the LEFT hand of the object seen with the *left* eye, the two objects appearing *at some distance from each other* as represented by the letters L E 1—R E 1—in the present figure.

From this result it is self-evident that, *according to the increase of the distance* between the pressures on the upper parts of the eyes, the seen crossed images *must increase their distance between each other*, until, by the time the pressure is on the

the OUTER corner of each eye: And the *apparent distance between* the two objects will be about *three inches, or more, taken at a medium.*

2.—If we proceed to operate upon the OUTER side of each closed eye at the same time; we shall see the two usual Objects, *each* of them *apparently in the inner* corner of its respective eye: And the apparent distance between them will be about *half of the former* distance—namely—*about an inch and a half;* though this distance, as will be hereafter noticed, will vary with a variation of the parts of the eyes impressed.

3.—If we impress the *upper* part of *one* closed eye, and the *lower* part of the *other* at the same time; the correspondent image in the *lower* part of the *first*-mentioned eye, and that in the *upper* part of the *last*-mentioned, will appear to be *about as far from each other* as in the case of pressure upon the outer side of each closed eye—namely—*about an inch and a half in point of height;* though the one will *not be perpendicular* to the other.

Upon this last-mentioned general fact, I remark that, my attention has been repeatedly drawn to observe that the VERTICAL LINE OF OUR FIELD OF VISION *is of a much more limited extent,* than the HORIZONTAL LINE OF THAT FIELD. At the same time; this is what ought to be, from all that has been advanced concerning the *correspondence* of Visual Images; and, also, from the *number and arrangement of the eyes,* both which, together, must take in a greater extent of horizontal view, than either eye, singly, can embrace of a vertical view. This remark, therefore, confirms the fact that our two eyes were made for two distinct co-existent fields of vision.

4.—But the most remarkable fact, in the phenomena now described, is that, in the case wherein we operate upon the *outer* side of each closed eye at the same time; and when, in consequence of this, we see each object as it were in the *opposite and inner corner of the* EYE THAT IS IMPRESSED; if we move the pressing instruments in *contrary directions,* we shall now see that the object occasioned by the *pressure on the* RIGHT *eye is* ON THE LEFT SIDE of the object occasioned by the *pressure on the* LEFT *eye;* that is to say, the SEEN OBJECTS ARE INTERCHANGED *as to their correlative positions,* or, in other words, THEY OCCUPY DIFFERENT VISUAL SITES in the perceiving mind, from what would seem to correspond with the eye whose pressure has occasioned them.

Here then, I say, is exhibited, in the most extraordinary manner, a crucial test of the existence of that Cerebral Visual Mechanism for the recrossing of Images, which has before been demonstrated in so many ways in the foregoing Propositions.

What can be added, here, to the suggestion now advanced, can only regard some details, and illustrations, of the phenomena in question. But the Principal Fact itself is one which, I trust, cannot be contemplated without the greatest cause of satisfaction that our Visual Constitution is in reality such, as has been all along herein asserted. And, hence, there cannot remain a doubt, but the Visual Organ,

which I have asserted as performing the office of a Third Eye, is really existent; and is the actual seat of the re-crossing (by which is strictly meant the new production) of the latest Tactual Visual Images, preparatory to their ultimate discharge on the mind.

Such appears to be the nature and extent of the matter now suggested, in its probable bearings upon the farther steps, (whether followed out by me, or by others,) of the investigation of Cerebral Vision; that, in order to its due illustration, I have supplied a PLATE, with Figures representing the various principal phases of the phenomena.

And, in the *First* place;—By *Fig*. 1, we see represented the several appearances displayed in the case here immediately to be described.— When pressure is made on the OUTER side of either *single eye*, and when this eye is open; we shall see the *usual circular object apparently on the opposite side* of the eye; and this object will *appear at* A P, as if it were on the *outside of the eye and touching the nose.* By carrying the pressure farther back on the eye; we can force the object to appear as if it were *thrust forward* in the situation of F, *or all round beyond the eye:*—but this last is a case not within our present investigation.

But, when the pressure is made on the *outer side of each* CLOSED *eye and at the same time;* (as was described farther back in article second;) we shall, in this case, lose sight of the fallacious appearance AS TO SITE OR POSITION of the seen object of each eye: and, if we now vary the pressure, by *contrary motions* of the two pressing instruments;

we shall find, to our great surprise and admiration, that the object seen by the LEFT eye is on the RIGHT-HAND SIDE of the object seen by the RIGHT eye,—the two objects, in their respective sites, being now situated as represented by R P.—R P.—indicative of their *Real Places.* Upon which wonderful display I shall comment, after describing the other phenomena in question.

When the pressure is made on the *inner side of each eye at the same time;* the usual objects will appear on the corresponding opposite sites represented by E and E, indicative of the *extremes of distance,* and of the relative situations, of this sort of object produceable by pressure on the eyes. And here I have to observe that, *Fig.* 1. represents the *actual tangible distance between the pupils of the eyes themselves, nearly to the truth of nature,* (in my own case at least,) it being rather more than *two inches and a half:* While, also, the *magnitudes of,* and the *apparent distances between,* the seen objects; (which I have placed behind the eyes, as being TOWARDS their *real* places, though *they appear as if* IN the eyes;) are nearly equal to those that are actually marked in the figure: and there seems to be little doubt, but these visual magnitudes, and distances, are nearly the same as the tactual.

*Secondly.*—By *Fig.* 2. are represented the two usual objects which appear when we press the *upper* part of one eye, and the *lower* part of the other at the same time. The apparent distance, *in point of mere height,* between the two objects, being about *an inch and a half.* But it is to be remarked, here: and the remark is equally applicable as an explanation of our deception with

which I have asserted as performing the office of a Third Eye, is really existent; and is the actual seat of the re-crossing (by which is strictly meant the new production) of the latest Tactual Visual Images, preparatory to their ultimate discharge on the mind.

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*Secondly*.—By *Fig*. 2. are represented the two usual objects which appear when we press the *upper* part of one eye, and the *lower* part of the other at the same time. The apparent distance, *in point of mere height*, between the two objects, being about *an inch and a half*. But it is to be remarked, here: and the remark is equally applicable as an explanation of our deception with regard to the site of the usual object when we see it *apparently on the side of the nose,* as in the case formerly described; that *the eye can be no judge of the* ACTUAL SITE of any SINGLE object, because it is *no judge of the distance of that object from itself.* But, contrary to this, the eye is, comparatively speaking, an *accurate judge of the actual sites of* ANY TWO SEEN OBJECTS which occupy *certain positions in correlation to each other,* as is the case of the two objects represented by R P. and R P. *Fig.* 1; and, is also, the case of the objects represented by E and E.

In order to illustrate what I have last said; I observe that, when we press on the outer side of the *left* eye, and the eye is kept open; the *part of the retina* that is impressed from without, is the *same part* that is impressed from within the eye by rays of light from the top of our nose. And the consequence of this is that, the outer pressure being the more effectual, we see the re-crossed image of the *peacock's feather* obscuring that part of our nose upon which it appears to ride; and see only that part of our nose which *appears round the feather:* both which appearances, we know, are in the mind itself. But, in this case, we are misled by our *previous knowledge of the real place of our nose;* that is to say, as the peacock's feather appears upon the nose, we are deceived into a belief that its real place is *not farther to the right than the middle of our possible field of vision.* And it is only when we see a *second and correspondent* peacock's feather, whose place we can compare with it, that we become undeceived as to its real site.

*Thirdly.*—By Fig. 3, are represented the other principal phases of that extraordinary phenomenon—the re-crossed objects seen in consequence of varying the modifications of the pressure upon both eyes acting in concert. And here we have to contemplate the appearances immediately to be described.

*First.*—When we press upon the *upper* part of each eye, ANY WHERE ON THE INNER SIDE OF EACH PUPIL; (always observing that a pressure by *continuous lively impulsions,* or, as steady pressure if at the same time we *wink the closed eyes,* is the most effectual,) we shall observe that the correspondent objects produced are occasioned, *each one of them by its own eye:* Which fact, *not being a fact of re-crossing,* does not require a Figure for illustration.

*Secondly.*—When we press upon the *upper* part of each eye, upon correspondent parts of the eyes *about half way between the pupil and the extreme outside of each eye;* we may observe, from moving the pressing instruments up and down in contrary directions, that the object seen with the RIGHT eye has *crossed over or changed its place horizontally,* so that it now stands on the LEFT hand of the object seen with the *left* eye, the two objects appearing *at some distance from each other* as represented by the letters L E 1—R E 1—in the present figure.

From this result it is self-evident that, *according to the increase of the distance* between the pressures on the upper parts of the eyes, the seen crossed images *must increase their distance between each other,* until, by the time the pressure is on the *extreme outer part of each eye*, the two seen images will be at the *farthest possible distance asunder* that any two CROSSED images can be, as has been represented by the letters R P—R P,—in Figure 1.

*Thirdly*.—In order to carry on this illustration, by now transferring our attention to the analogous results which take place when we press upon the *lower* part of each eye, *upon corresponding points that are less distant from the middle of the eye than in the last case*, but yet, far enough on the side of each eye to produce *some degree of crossing;* we shall then see the two objects as represented by R E 2—L E 2—in which diagram the two circular objects appear to have *wholly crossed, but no more*,—they presenting themselves in *contact with each other*.

To return, now, to the *upper* parts of the eyes;—When the pressure is made on the *upper* part of each eye, upon corresponding parts that are *only a very little on the outside of a supposed line passing perpendicularly to the horizon through the pupil of each* eye; which limit I may be allowed, for distinction's sake, to call the VERTICAL LINE OF THE CROSSING OF VISUAL IMAGES; we shall see the two circular objects *intersecting each other;* while, also, they have *partly crossed*, as represented by R E—3—L E—3.

It is plain, from all that is here demonstrated, that, when we press upon points that are VERY NEAR the *Vertical Line of the Crossing of Images;* the result ought to be a *confounding, by co-incidence*, of the two circular objects INTO ONE SAME OBJECT, upon the very same principle as that on which, when we make use of two eye-tubes, the seen two circles occasioned by the two ends of those tubes are *reduced to one same circle*. And, accordingly, this very result takes place in the present case.

In a word; When we are contemplating the re-crossing of the Visual Objects, in the various phases of the phenomena illustrated by Figure 3,—we are in a visual predicament perfectly similar to that in which we have, on other occasions, contemplated two different visual objects thrown upon each other by two eye-tubes: with this only difference, that, in the present case, the objects, in all the different modifications of them except one, are thrown *not merely upon*, BUT ACTUALLY BEYOND each other.—At the same time it is to be observed, that although, in treating the Subject under the Fourth Mode of Vision, I have adverted to the use and capacity of eye-tubes no farther than to mention their bringing their two fields into a *co-incidence;* it is here to be added that, by a crossing of two eye-tubes, in the manner of the *legs of a pair of scissors,* we can throw their two respective fields of vision *across and beyond* each other, precisely in the same manner as that in which the two peacock's feathers are thrown across and beyond each other in the case now under our consideration.

And here, in order to prove the *perfect identicalness* of the two cases of vision—namely—that with two eye-tubes—and that of two peacock's feathers;—I add the following observations, which could not have been brought in so suitably before. —*First.* When we look with both eyes open; we can see BOTH the peacock's feathers, indeed, and ONE *will be very vivid; but we cannot see both so instantaneously*, or so *vividly*, as is the case when the eyes are closed: for which reason it was that, I mentioned the eyes should *usually be closed* in such experiments. Now the *difficulty*, when the eyes are open, of gaining, or of keeping steadily, a sight of both the peacock's feathers at the same time, is precisely of the same nature as that difficulty which we experience in gaining, or of keeping steadily, a sight of BOTH *objects marked on a pair of caps, at the farther ends of two eye-tubes*, as was explained in the Section which treats of that matter. The fact, in each case alike, proves that very few persons, in the *ordinary* business of vision, see the same object with both eyes at the same time; although men in general are deceived into a belief that they do see in this manner.

*Secondly.*—The circumstance that, on *commencing* the pressure, and when we look with the eyes closed, we *instantaneously gain sight of both* the peacock's feathers, and preserve them *steadily in our visual contemplation* without the smallest disappointment, or straining of the eyes, farther proves the *perfect identicalness* of the present case with that of our seeing according to the Fourth Mode of Vision—namely,—one Object or Image with one eye, and another with the other.

From all that has been demonstrated, therefore, there cannot exist a doubt but, in the case of the two different fields of vision which we see when we have crossed two eye-tubes like the two legs of a pair of scissors, that the *field, or image, which we see on the* RIGHT *hand,* and which is occasioned by a *retinal image in the left eye;* and that field, or image, which we see on the LEFT hand, which is occasioned by a *retinal image in the right eye;* are *re-crossed,* or at least *newly produced,* visual images in the mind, in consequence of the previous retinal impressions.

To sum up this very extraordinary history; I have now to add that, when we press upon the *open* eyes; we can not only see both the peacock's feathers, but, with difficulty, we can gain sight also of our nose, with EACH eye. And herein we contemplate the most preposterous phenomenon that can well be imagined: For, while we now see the *right side of our nose* with our *right eye,* as we should expect it to appear; we see it *stand on the* LEFT *side* of the LEFT SIDE OF OUR NOSE as seen with the *left* eye:—In other words; in our present field of vision, with both eyes, we see *two images of a side of our nose, the one image preposterously toward the other;* and the image that stands on the *left,* is that seen by the *right eye;* while that which stands on the *right* is that seen by the *left* eye; insomuch that, we *behold at the same time two noses obliquely point to point.*

Among the other consequences of this strange exhibition; it is certain that, as each of the seen images is seen in consequence of a retinal image which falls with the *utmost possible obliquity on the retina,* we have herein a final confirmation of the fact that Dr. Potterfield's *Principle of Perpendicularity* is utterly void of foundation in nature. It remains therefore to repeat here, that the two fields or images of vision, which we see apart from each other when we employ two crossed eye-tubes, are *not seen on a Principle of External Direction;* but they are *Proper Visual Images consisting of Sensations of Colors in the mind itself.* Thus, when we see our nose as *two noses standing point to point;* and, know that we see each of them with the *eye that is situated on the contrary side* to that of the seen nose; we are certified, beyond all question, that the noses we see are not seen on a principle of *external* direction: because, when we look at that part of each nose to which a peacock's feather adheres; we know, that the *feather* and the *seen nose to which it adheres* MUST BE BOTH OF ONE SAME MATERIAL, AND IN ONE SAME PLACE; while, also, we are certain that the peacock's feather is mere sensation and HAS NO EXTERNAL EXISTENCE.

Nor is this display of Nature yet ended: For, after trial and a little practice, if we look toward the point of our nose, with our two eyes: (*without pressure,* and, consequently, without seeing the peacock's feathers,) we shall gain a sight of two noses, as we did in the case wherein we employed pressure. And here, by shutting each eye, alternately, we may prove to ourselves that the *nose on the* LEFT HAND is seen with the *right eye;* and, the *nose on the* RIGHT HAND is seen with the *left eye:* And the only difference between the present and the former case is that, instead of standing *obliquely point toward point,* the two noses will stand *side by side* each other in the *collateral* positions of two horses in a carriage.

Here, then, are wonders that make the elegant and important phenomena of the double pin's heads sink into trifles in comparison. And here, the grand fact of the re-crossing of images within the head is, in the most unexpected manner, demonstrated: because, it must be manifest to all persons that our REAL EXTERNAL nose MUST be seen,—its *right side* with the *right eye*, and its *left side* with the *left eye:* and therefore it is confirmed, most certainly, that the TWO NOSES WHICH WE SEE *are* NOT THE TWO SIDES OF OUR REAL EXTERNAL nose.

If farther proof could make the fact in question appear stronger; we are to observe that, the two seen noses *do not join*, as the two halves of our real external nose join; but they appear *about an inch and a half asunder*. Now the reason, they do so, is plain; it being because each seen nose is seen in consequence of an impression in the eye; and the different retinal impressions fall upon parts that are not calculated to produce a junction of visual objects behind the eyes; but they make the seen noses stand apart, on the same principle as two arrows, marked out an inch and a half asunder, and one of them seen by each eye, would appear an inch and a half asunder.

To what has now been said, is to be added the momentous consideration, that, in the case of *Vision without External Objects*, we have THROWN AWAY OUR EYE-TUBES; and, with them, have THROWN AWAY, OR EXCLUDED, *also* the EXTERNAL WORLD: And we NOW contemplate ONLY *those* VISUAL OBJECTS *and their* CROSSINGS, *which form the* FIGURED WORLD OF OUR OWN MENTAL MODIFICATIONS.

And here I leave this matter, for the contemplation of the Philosopher, and of every reflecting mind. And, if there be any enlightened person, who, upon being first introduced to this display of the power and wisdom of the Creator, as manifested in the contrivance of such a Mechanism, does not feel a sentiment of a very peculiar sort; I must own myself a child, by confessing that it impressed me with such a feeling, in a very strong degree. I speak not with a moment's regard to my having had the accident of falling first upon the thing. But I speak the feeling which the FACT OF THE CROSSING forced upon me, in the opening of its aspect. Nor must I here omit to notice, also, the impression which the *extreme beauty* of the phenomena cannot fail to make, upon any mind that is ductile to a display of Nature: Their richness, and lustre, and symmetry, and varying change of correlative place, in an instantaneous obedience to every contrary pressure, exhibit, to an admirer of Nature, a display,—AND A SYSTEM,—as splendid, as it is wonderful.

If Bishop Berkeley had fallen upon these Phenomena; and had beheld them, at his bidding, revolve round the eye, and round each other, like the bodies of our Planetary System; he would never have denied that a Being, endowed with *Sight alone*, might have learned not only the Science of GEOMETRY, but that of ARITHMETIC ALSO, without any knowledge whatever of the existence of an external *figured* world.

THE END.

# E *to illustrate* SECTION FIFTH.

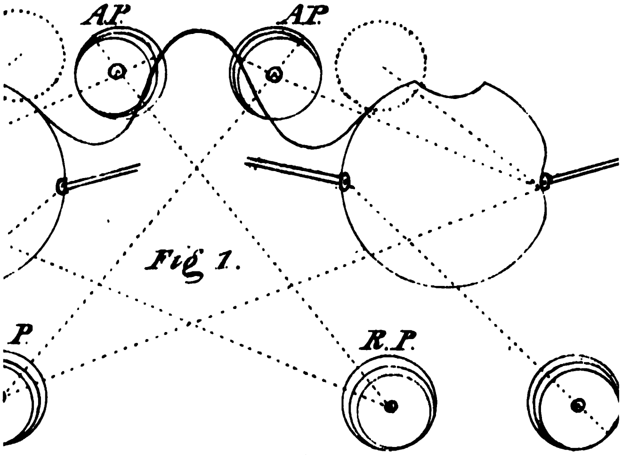

Fig. 1.

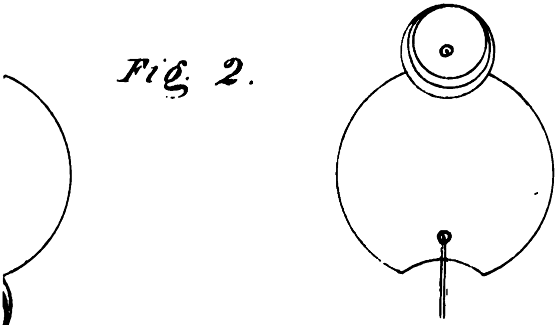

Fig. 2.

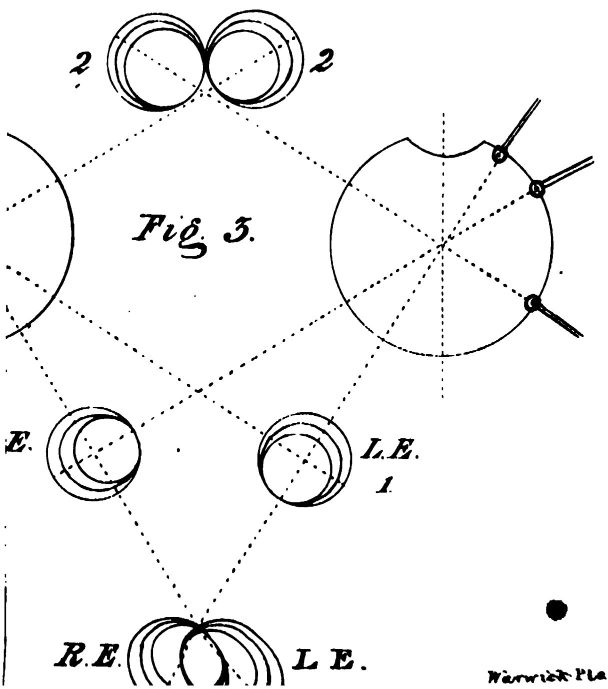

Fig. 3.

Warwick Place

# COLOR IMAGES IN THE BRAIN;

BEING an account of the detection of Visible Objects, seen posited on exchanged sides in the Brain, after the intromission of impressions of light, reflected from external objects, one in each eye:—a description of which facts formed the substance of a paper read to the Royal Society at their last meeting;—of which paper, the Society has printed an Abstract;—the present print being intended as a Supplement to the previously-published RATIONALE OF THE LAWS OF CEREBRAL VISION:—BY JOHN FEARN, ESQ.—London: Published by Messrs. Longman and Co., and Rowland Hunter.

## INTRODUCTORY STATEMENT

*Of the first reception of the fact of Color Images in the Brain, in England: involving remarks on the Change induced on the State of Philosophy by the detection of that fact.*

EVERY reader, either of the present Paper, or of the Rationale which preceded it, except those who are intimate with philosophy, will at first suppose that he is only going to be introduced to a new stage of the *Physiology of Vision.* But every reader, of the least liberal education, will be satisfied, before he get through this Preface, that the detection of Color Images in the Brain is not only a stage in the physiology of Vision, *and of the Brain;* but it is also a test, which exhibits to *ordinary* cognisance the final collision of two of the most comprehensive philosophies that ever divided the opinions, and affected the weal, of mankind—namely—the Philosophy of Newton, and that which has held it in ridicule,—an assertion which, be it observed, I here make with regard to every reader considered as a juryman upon the *mere matter of fact;* without requiring any knowledge, or consideration, of the *philosophical bearings* of that fact. At the same time, it is here intimated, to the *philosophical anatomist and physiologist of the brain,* that a field is opened to his research, where the present paper leaves off: concerning which, more may be hinted in the sequel, but must be postponed, at present, to immediate considerations. In this place is merely called to his recollection, the optical approbation and celebrity which followed, (and not unduly so,) the discovery of *seeing a pin's-head double, with one eye:* which fact, neither the discoverer of it, nor any of his commentators, ever discovered to be a fact of *recrossed vision;* and which, therefore, has remained an insular and sterile fact; whereas, the demonstration of the recrossing in question is now laid out, in Prop. 21 of the Rationale, and illustrated by the Figures 3, 4, and 5, in the first Plate in that work: And, then, let him mark the character of the first reception which has been given, in England, to the detection of Color Images recrossed in the Brain; although the disclosure did not come to the public by gradual approaches, but all at once, including all the Dioptrical Propositions which *preceded, and led to,* the detection of the ocular demonstrations; for, not one of these detections of phenomena was *stumbled upon.*

This appeal is made in the full confidence, that there is liberality enough in the English Press, to insure justice on its merits; especially noticing, that the present Supplement differs from the Rationale, in this: that it *demands no knowledge of Optics, or Science,* to enable every Gentleman, of the least liberal education, to pronounce, *on his own judgment,* on the facts, from a bare inspection of the Figures given in the annexed Plate for illustration.

It is one of the peculiarities of this appeal, to impute no active wrong, in any quarter: because there certainly is neither any contradiction, nor any *tangible* opposition, to be overcome. But it is a melancholy sign of the times, when Scientific Institutions, and Literary Associations, are multiplying around us, with the profession, and doubtless the intention, of most liberal, not to say noble encouragement and protection to the labors of knowledge, to find that, both Science and its Votary, even when the latter is of no pauper class, (if he put his trust in mere insular labor, unlinked to the interests of an associated body,) may find a common grave in an oppression for which, for *all that he* can say, *nobody* is to blame!

Secured by testimony, beyond any attempt at denial, from authorities* to which intentional injustice in my favor will never be imputed, that I have fully established my claim to a place in more than one department of the science of the country; and that, my labors, owing to their being not open to popular, or mere literary adjudication, have been barred up, even from the scientific world, by causes very extraordinary, and undeniably oppressive, but chiefly by exclusion from the leading channels which convey to Europe the various contributions of science; I hope I have established also another claim, in an appeal to English feeling, by the length of time during which I have persevered, in the face of such obstruction, until the evening of life has closed in, and threatens to terminate the struggle.

Before I narrate the fact of the non-recognition, in scientific quarters, of a contribution to PHYSICAL science in the case of the Rationale; it may be proper to signify, that the immediate object, to be desired, is to have the matter sufficiently called to the attention of the *Continental* Philosophers: From whom, perhaps, the first effectual operation of it may return, in a reaction—perhaps dexter—*perhaps sinister*—to the Country from whence it emanated! Such is the state and prospect of the subject at present: Though it is not to be doubted, but there are enlightened individuals enough in the Country (if the matter be once brought to their knowledge,) to estimate the degree of credit which such a reaction would reflect upon that country.

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* MONTHLY REVIEW, in its analyses, and remarks on my pneumatological writings, often, and especially in its notice of the Rationale, Sept. 1831;—effectively, also, in the close of its remarks on the Parriana, Sept. 1828;—and, at large, back in Feb. 1822:—ARTICLE PHILOLOGY, in the *Cyclopædia Edinensis*:—Dr. Parr's estimate of the Essay on Immortality, published in the *Bibliotheca Parriana*: not to mention other instances.—It is for others to judge, whether the necessity for such testimonials at so late a day, is creditable to English philosophy. But, in case it be possible that I must forego the prosecution of the research, to devote myself to the obtaining of justice; I cannot choose but cry out upon the apathy with which the country has looked upon the happening of it.

The description of Visual Phenomena, now submitted to the press, has been withheld from publication during twelve months, owing to my having, in the first instance, presented to the Royal Society so unlooked-for a proof of the truth of Sir Isaac Newton's belief, that *Color Images, during vision, exist in the Brain.* And the same cause has induced me to delay the sending of the previously-published Rationale, (of which the present Supplement will henceforward form, by far, the most popular, or obvious feature,) to its intended special destination, as expressed therein, in my address to the French Philosophers. The substance of this paper, therefore, was read to the Society, at their last meeting, in June, under the designation of "*Recrossed Vision.*"— And considering that, I suppose, several hundred Papers were presented; it was perhaps rendering full justice to the case that mine was one of those read. Nor shall I, upon mere conjecture, affirm that, in the existing tide of contributions to science, there were not a dozen papers bearing more immediately upon pressing subjects than mine. I am, also, the more disposed to acquiesce, as the Royal Society has caused an Abstract of the paper to be printed: although it is manifest that *any abstract, however effective,* could convey the subject only to a small portion of the scientific world, leaving it locked up from the community at large. I had, indeed, confidently reckoned upon *some* recognition of the subject; because several of the Fellows of the Society, besides other persons, had *witnessed* the phenomena: and, accordingly, I have to acknowledge, a recognition has thus appeared. The nature of it, however, demands my farther notice at the end of this print: but here I proceed.

Copies of the Rationale were sent to the Royal Institution, and to the Editor of its Journal.—Since then, there have appeared, in its succeeding Journals, two Papers, illustrated by Plates with very numerous figures, on ***Foreign*** contributions of Ocular Phenomena: In no part of which Journals is the most distant suspicion hinted of any such thing as *recrossed vision, or color images in the brain;* nor any, the least, tendency toward such a discovery. And yet, I believe, so much as the name of the Rationale is not to be found among the incidental notices afforded in their pages; although, indeed, I have to acknowledge the usual Letter of thanks, for the copy presented.

Copies were in like manner sent, *officially*, to Dr. Brewster, as Conductor of the "*Edinburgh Journal of Science;*" and to Dr. Lardner, as a Conductor of *Scientific Dictionaries*, and "*Libraries*," and *Professor of Natural Philosophy in the University of London;* besides a copy presented to that University. And all, I believe, with the same result that followed those sent to the Royal Institution. It remains for me now, therefore, to contrast this manifested deadly apathy on the subject, with the several manifestations of *vitality* to the interests of the *very same science,—the very same department of that science,*—by the *very same persons:*—of whom, however, I have no personal knowledge, nor any surmise of their active opposition to my views. In drawing this contrast, I give notice that it will involve the statement of considerations, to the last degree important to the fate of philosophy: of which, I have no doubt of receiving the assent of every reader in the least degree competent to the subject. The statement of the case, therefore, is of an interest immeasurably greater than any consideration affecting either myself, or the other parties here immediately concerned. The great impending consideration, to which I now allude, is this:—The genius of Newton has, during nearly a century, undergone the last degree of pointed derision — whole pages of set and consecutive ridicule,—unanswered, I believe, by any writer,—for his believing that, during vision, *Color Images are called up in the Brain:* In other words, Newton has been held, *upon this positive statute of derision,* to be a *Philosopher of* BODY ONLY,—and NO PHILOSOPHER OF MIND.* But, What will be said, now that phenomena have been detected, which, in all their varieties, flash conviction, upon the learned, and the unlearned, that Newton will never more be ridiculed for believing that, during vision, color images exist in the brain? If there be ears in Europe that are open to the cries, or hopes, of true philosophy; one should think, they must be electrified by the communication of this fact; which, the incalculable moment of the matter demands should be repeated here, in the most impressive terms:— Therefore, I do repeat, (and this with a sense of the thing which I could not express,)—*No philosopher will ever again* place his reputation in the predicament of ridiculing the genius of Newton for believing that color images, during vision, exist in the brain: and this, for no less a reason than that *color images in the brain and recrossed vision are one and the same fact.* Those who are in the subject, and who therefore understand the fate in which this fact seals up not only the philosopher, *but also the* PHILOSOPHY, which ridiculed Newton, may conceive why the apathy, if not the antipathy, of many persons should meet the detection of recrossed vision. But, now for the contrast, above proposed.

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* For a matter upon which such consequences depend, See, in Reid's "INQUIRY INTO THE MIND,"—Chap. 6, Sec. 19th,—a raillery carried on with unsparing pleasantry, in pages 346,—7,—8,—9, and 10; until, at length, poor Newton, and his companion in disgrace Dr. Briggs, receive a dismissal from the fire of that battery, in the words—" *But to be serious.*"

On two different sides of the *Times Journal*, for September 3, 1831, there are extracts from *Dr. Brewster's Life of Newton*, in the "*Family Library*:" in one of which, he says—" The modesty of Newton, in reference to " his great discoveries, was not founded on any indiffe-" rence to the fame which they conferred, or upon any " erroneous judgment of their importance to science."—And, then, with allusion to a simile of Newton's on this topic, equally modest and beautiful, Dr. B—— exclaims—" What a lesson to the vanity and presumption of philo-" sophers,—to those especially who have never even found " the '*smoother pebble*,' or the '*prettier shell!*'" The aid thus afforded in the *Times Journal* to the Work in question, or to any such Work, is liberal, and fair. Nor do I anticipate that the *Times* will hold back its vast power of doing justice, from such a cause as that now at issue. But, with reference to the just moralising of Dr. Brewster, I ask; Will he stand up, and under his name deny that recrossed vision is *one of those smooth pebbles, or curious shells, which Newton would delight to have handled*; as is proved by his *recorded experiments on the Optic Nerves, in attempts to solve the problem of erect, or cerebral vision?* Or, Will Dr. Brewster deny that the fact of recrossed vision is *completely established, even in the Rationale, upon ocular demonstration*, in the case of our *seeing the recrossed peacock's feathers*, when we press both eyes simultaneously, as is illustrated in the Second Plate, in the Rationale; that is, I say, *established antecedently to the fact's being recognised by the Royal Society*, in their Abstract, already noticed? But, if Dr. Brewster will not place himself in the situation of denying this; Might it not, then, have been expected that, in his character of an Optical philosopher, he would have spoken out, on the occasion of an advance in optical science which, I have shewn, has determined for ever the fate of a most pretending and very influential philosophy: and which result he must, as an Edinburgh philosopher, well know, (whether or not it can be delayed,) cannot be averted, on whichever side he may happen to sympathise. This question, also, comes with the more force when I state that, in a very remarkable foot note in the Rationale, I expressed my expectation that Dr. Brewster and Dr. Lardner, whom I therein complimented as eminent optical professors, would, in their office, afford their recognition to the matter.

The case is made far stronger by the silence of Dr. Lardner. And it is of very material moment to contrast, here, his non-recognition of the subject, with what he has most conspicuously expressed of *Newton's Philosophy of Mind*, in a quotation at the close of Dr. Lardner's account of Newton's Optics, in the "*Library of Useful Knowledge.*" The passage in question exhibits the language, *and the Creed,* of Newton with regard to the nature of Mind,—a Creed which must carry conviction, to the most ordinary reader, that Newton's Philosophy of Mind is indisputably established by the facts of recrossed vision,—a creed, therefore, which, if I have not lamentably mistaken the bubble-evanescence of chimeras, for the stable utility of philosophy, deserves, for its incalculable moment, to be written on every hand,—especially since every one, who does not himself understand the problem, may be assured that Newton's Philosophy of Mind is vital to the happiness, and the hopes, of mankind. The quotation, which does so much credit to Dr. Lardner's judgment for having *deemed it the best which he could select in order to close his account of the Optics of Newton,* runs thus,—"And these things being "rightly despatched, does it not appear from the pheno- "mena that there is a being, incorporeal, living, intelligent, "omnipresent, who, in infinite space as it were in his sen- "sory, sees the things themselves, intimately and tho- "roughly perceives them, of which things THE IMAGES "ONLY, carried through the organs of sense into our little

" sensoriums, are there seen and beheld by that which in " us perceives and thinks."

Here I put it, to the philosophers of every country, whether it will be in the power, even of prejudice, for a moment to deny that the truth of this Creed of Newton is *realised,* with the most conclusive certainty, by the fact of color images called up, during vision, in the brain, as witnessed in the phenomena described, and illustrated by the Figures, in the Plate supplied to this Paper? Or, rather, I may repeat, on account of its great moment, what no one will deny, that the *creed of Newton and recrossed vision are one and the same thing.*—Might it not, then, have been expected that Dr. Lardner would have been forward to bear testimony, and give his support, to a realisation so important to philosophy, as well as vindicatory of the genius of Newton?—Shall I suppose that he does *not know* that Newton has been held, (as I have said,) a *beacon and a by-word,*—by the founders and advocates of the opposite philosophy, for his belief in color images? And, if he *does* know this; Can I suppose that he, or any man of name in the present day, will desire, when the subject shall become matter of history, to have it imputed to his memory that he looked on, and saw the realisation of Newton's conjecture, with all its incalculable consequences, struggling into parturition; and, yet, denied it respiration?

And here, in alluding to men of name, the subject imperatively requires that I turn from Optical Philosophers, to *Metaphysicians.*—There is one name, at least, in the Country that has long been eminent for tact, and knowledge, of the different metaphysical theories which now compete for predominance in the world; though I am to suppose that the distinguished individual, who bears it, is altogether unacquainted with the existence of my views, and therefore of the present struggle: to whom, from not being better informed, I should incline to attribute some recent papers on the theories of the Continental Writers, and in advocation of the Reideian philosophy, published in the Edinburgh Review:—I mean, Sir James Mackintosh.—And here I claim of him, on public ground, and public right, (*it cannot be fit I should supplicate,*—I appeal on *no abject—no inferior* ground,—I honor; but, pressed upon it, I ask, What friend would advise me to exchange philosophical labors with him?)—most earnestly, and solemnly;—or the wheel be broken at the cistern,—and while the great and the little,—the noble and the ignoble, —the man who lives for present, or dies for future fame,—in a word, every man now living who owes, with me, a responsibility for whatever talent he possesses, is verging to that goal which forecloses all power of earthly justice, and brings man into account with his Creator; that he do, in some manner adequate to the occasion, declare,—*as a* Scotch Metaphysician, — if,— or how, — *he can* dispose of *Color Images in the Brain!*—But, if Sir James will not do this: then, under the revolting injustice of the case, I am urged to say;—Let him, for the moment,—(and I suppose no man better may,)—represent not only the philosophy, but also both the manly feeling and the scientific pride of the Country; and answer, —In England, which boasts her moral distinction above the nations, Shall a man who, for twenty years, has been *acknowledged* to have *shewn cause* against the Scotch Philosophy,—whose speculations on the philosophy of Language are a theme in a *Scotch Cyclopædia,*—and who now presents, (in the completed Rationale,) not a problem, but a new *Science comprehending many problems, that were experimentally sought by Newton,*—Shall he, only because he has worked ungraduated, unmatriculated, and unharnessed to the courting of influential men, be treated like a dealer in *contraband;* and die a victim to a proscription which will fill future men with astonishment?—Am I, then, a sacrifice to *mere apathy—the mere philosophical apathy of the country?* Or, are there no private sympathies, and jealousies too, concerned in the doing of it?

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*Note.*—As men of liberal minds naturally take an interest in any important subject which they *understand;* it is here explained that — If a spectator

# COLOR IMAGES IN THE BRAIN.

*Of the immediate bearings of Philosophy upon the Political and Domestic affairs of mankind.*

IT is the known result of research, frequently to show us connexions between subjects of knowledge, in their several natures apparently the most distant from each other. The occurrence of Color Images, or in other words Visible Objects, detected in the head, affords one of the most remarkable, as well as important, examples of this fact. And, hence the interest demanded by the following sketch of an existing and indubitable state of co-incident circumstances.

The known *inconsistency* of the Human Intellect is one of the most mischievous of its defects. And, in no case does it operate *so extensively*, in its mischief, as in that for present consideration. Within the memory of those who are still living, England has paid, besides a vast amount of blood, and tears, the better half of a thousand millions of her money, as her attesting signature to the fact, that PHILOSOPHY can carry spoliation, or misery, to every fire-side in Europe: AND, YET, Englishmen—educated and enlightened Englishmen,—almost one and all,—maintain a fatal apathy, if not a contempt, for the very Name of PHILO-

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place his two eyes within an inch, or two, of the *two half faces* in the Plate, (*Fig.* 7;) he must inevitably see the two halves *transposed*, and *reformed*, into a *proper whole face*. And most persons, also, can see a similar result, from a mere inspection of the other figures in the plate.

Now the bare enunciation of this fact, as witnessed by any gentleman in the conduct of a Literary Journal, or Periodical of Criticism, may compensate for any silence of scientific reports, and essentially serve the subject, by conveying, to philosophers of every country, a hint which, *they will discover, involves all the consequences in question*. It is herein that the general Press can *command* justice to be done. It is not that there is the *least demur* to the reality of the fact, or that it requires *confirmation*. The only evil is,—How should Europe,—or, even, How *should England*, otherwise KNOW the fact, when I have shown that the Scientific Authorities have *agreed*, (I do not say *conspired*,) in the determination of not letting it come through their channels?

SOPHY, *under an inveterate belief that it has no immediate bearing upon the affairs of life!*

I must not be understood, here, as imputing to philosophy the reactions which have convulsed and appalled Europe in our own times: because, there can be no doubt, but men of ordinary understanding, ordinarily informed, under suffering from misrule, might have proceeded to the same reactions. But I stand here upon the fact, whch no one can deny to me, that *a Philosophy,—the "Philosophy of Nature," involving the Creed of Eternal Sleep,—generated a Spirit,* which rendered those reactions *unnecessarily horrible;* and, also, rendered the nerves which it actuated *more desperately energetic* in conquest, and in mischief. Nor can it be pretended that the spirit of the creed of eternal sleep either *has been,* or *is likely to be,* laid by that of the British Philosophy which, *if it were only founded in truth, or at all commanding the respect of the Men of "Nature,"* might certainly have led to better things. The Philosophy of Scotland has been laboring, to exorcise the fell spirit of Atheism, during a period approaching to a century! Has it made any progress in this holy work? Let the question be answered by the most accomplished, most dignified, and most influential writer of the Scottish School. And, assuredly, reflecting minds must be impressed with the evidence which such a witness bears, unintentionally, against his own cause. The late Professor Stewart of Edinburgh, in that Work on Morals which, it may be said, he bequeathed to the world almost in the article of death, has expressed himself on this question as follows. And the value of the confession I conceive to be almost incalculable, if mankind will only avail themselves of the information, and the lesson, it holds up.

" From this time downward we may trace the rise and
" progress of that disposition to '*persiflage*,' which has been
" so long the characteristical of the higher orders in France,
" and which, a few years ago, some individuals in our own
" country were so ambitious to copy. In France it seems

" to have attained its greatest glory during the gay and un-
" principled period of the regency; and ever since it has
" left sensible effects, not only on the tone of fashionable
" society, but on the spirit of most philosophical theories.
" —The following Speech of Cleon in the *Méchant* is an
" invaluable document for the history of French manners,
" (now alas! too widely diffused all over the civilised world,)
" during the greater part of the eighteenth century."

*Phil. of Morals, Vol.* 1. *page* 212.

Of the importance which Mr. Stewart attached to the document, which he thus pathetically introduces, those, who have not seen it, may judge from the circumstance of his giving it not only in French, but in English also. And it is impossible for the least-sensitive reader, to contemplate the exquisitely-polished and adamantine profligacy, which issues from the mouth of Cleon as the *glass of fashion of the "higher orders;"* (wherein he finishes by exclaiming that,—" the only crime now known is *ennui;*")— without recognising, at once, the *philosophical workshop* in which that glass was manufactured. The fact, therefore, of the direct bearing of philosophy upon human manners, and happiness, as testified by the reflection of Mr. Stewart now under consideration, does not admit of a moment's denial.

Do I, then, intend to reproach the French Philosophers, with the Atheistical creed which has wrought these effects on society? Certainly not. Their creed was the result of *their view of the* DATA. And it is not by reproach, but by research, that any one can hope to change, or affect, their conclusion. I may, at the same time, put it here, for their consideration, that, in those four laws of Visual Perception (which I called the *Laws of Primary Vision*) formerly advanced; and, still farther, now, in the detection of Color Images in the Brain; they have *new data,* of a far different complexion from those upon which they proceeded. And I may well hope, (*from my own former belief in Matter,*) that, if once their attention be adequately called to discern the connexion between Color Images in the Brain and the legitimate philosophical deduction of the *Spirituality of Mind* and of the *External World as a Mind involving, in its Infinite Volume, all finite minds*; the result may prove the happiest, for the human species, that ever awaited philosophical speculation. But this consideration I have been led into incidentally, by the way. And I resume the previous topic.

If we but view the philosophy of Eternal Sleep, *only as an actuating political* principle, tending to set the men of one country upon war and spoliation of all around them; strangely inconsistent does it appear, with what apathy this principle has been beheld by ourselves, although the fact is within our memory that it had, once, well nigh led to the subjugation of Britain herself, into a province, and a handmaid of an invader. If, instead of building a *philosophy*, the hostile nation which threatened her had built a *navy*, with intent to the conquest; What would England, then, have done?—*Looked on with apathy?*—*No such thing.*—She would instantly have built *an opposing navy, of adequate power to her defence.* Why, then, should she act differently, when the danger *has been, and may again be*, equally great; not, indeed, from a navy; but from a philosophical creed?

But, dropping here the *political* bearing of the subject; because, in fact, it is *by far the least important* consideration before us; Let us, now, revert to the *domestic*; to which we have already been introduced by the moral reflection of Professor Stewart. It is not, then, *as an open—a political or national foe*, but *as a profess domestic friend*, that mankind have most deeply to fear the philosophy of *eternal sleep*. At a stage of the *advancement* of society, in which, no gentleman, or lady, of the higher, *or of the lower* orders, can enter her *social circle*, except to meet the stigma of *lost cast*, unless she has travelled to the Continent, and for a due season inhaled the *effluvia* of "*persiflage*;" Can any one doubt that young and ductile minds, so enlightened, must contract, and bring home, *a smack of atheistical enlargement of their understandings?* And, Can it be doubted what effect this MUST *have*; —nay, what effect it *has had;* upon the mass of society in Britain? I might pursue this consideration, with melancholy truth, to a far greater extent. And, indeed, I might ask—To how many firesides *has it not* in reality been carried. But the delineation of it cannot be necessary here, since the proof of the fact is already too complete. At the same time, however, I may remark that *many persons* appear to suppose that the bulk of mankind is made up of *believers*, and *unbelievers*, and a *few fixed sceptics*. But they have not reflected deeply, who have not discovered that, a large proportion of society consists of persons, (especially those who have travelled, and have undergone a shaking fit from the *malaria of persiflage,*)—who *ever after librate*, between belief and atheism; and usually oscillate to the *latter when they either act or deliberate;* though, in returning to the former, they may regret.

It must not be mistaken, to suppose, that my intent, or object herein, is to *moralise.* It was Professor Stewart only, and that very appropriately, whose object it was to moralise, in the reflection which I have quoted from him. My intention, on the contrary, is *merely to assert and prove a fact*—namely—that of the *direct bearing of philosophy upon human affairs, both political and domestic*; and of the *wonderful inconsistency of intellect with which this fact is overlooked in England.* And, I suppose, no such fact could be more certainly, or pressingly, made out.

In fine, then, I would impressively call to general attention the following remarks. The Philosophy of Scotland *is sublime*:—But it is a *sublime vision,* founded in mistakes; the happening of which, nothing but their history —(given elsewhere)—could render credible. And, besides its *visionary essence,* it is professly embarked in the same bottom with the belief in MATTER—the fulcrum and foundation of all atheism,—a belief which, *its advocates own,* has no other than a *natural prejudice of untaught man for its voucher*—namely—that prejudice by which, when a clown strikes his foot against a stone, he confidently believes he touches *solid body;* while *all natural philosophers now know, and are agreed,* that he is deceived, and touches *nothing but* SOMETHING IMMATERIAL. At the same time, the Philosophy of Scotland, in point of *sublimity,* is as far beneath that which *explodes* MATTER, as a soap bubble is beneath that of the ORB whose rays render that bubble visible. From what I have now said, the Philosophy of Scotland *never has resisted,* and *never will* in the least degree *resist,* the torrent of atheistical opinion, in any country. And it is here, on the testimony of Professor Stewart himself, that it cannot, in the least degree stop that inundation of persiflage, which certainly, though silently, saps, and rots to the foundation, the *very pretence* to moral rectitude; which *pretence it proscribes* as being certain hypocrisy in the pretender: *For, such is* PERSIFLAGE.

But, *the existing case, which* NOW calls for examination, is this: The Scotch Philosophy,—thus impotent, and many times refuted, though refuted without its being listened to, is that *same* which ridiculed the Philosophy of Newton—ridiculed it upon the *vital assumption*—vital to the subject in question—that *Color Images could not exist in the brain.* And, I here repeat,—(and I could not repeat it too often for the sake of what impends,)—*No philosopher will, ever more, ridicule Newton for his belief in Color Images!* May it not, then, be expected that thinking men will, NOW, examine farther into the merits of Newton's Creed,—a creed which is identical with that of Locke; and, on the investigation of the problem which involves it, I may firmly believe, I have labored longer, and with more intensity, than any man now living, or perhaps than any man that ever lived; but which creed has, with a violation of truth altogether astonishing, been misstated as being the *same with that of the Ideas of Berkeley and of Aristotle?* Of course, I do not affirm that there has, in that misstatement, been any *intention* to misrepresent: But it is strongly urged upon me to declare, at this stage of my speculative life, that the violation of truth, (supposing it to have been a mistake induced by *mere hasty prejudice*,) of the confounding of *Locke's* "*Ideas*" with the "*Ideal Theory*," was perhaps one of the *most gross*, as it has certainly been one of the *most mischievous mistakes*, that ever disfigured the history of philosophy: And I have repeatedly cried out upon the enormity of that confounding; though *existing sympathies, apart from apathy, have hitherto been too strong* to let it be heard. Whether, or not, the Philosophers of France will effectually recognise the distinction which I now urge; I affirm, as being of the last moment to the subject, that the *so-called* "*Ideology*" of Locke would not be *more falsified* if men were to attribute to his "Ideas" the properties of *inertia, attraction, and repulsion*, than it would be by asserting that they have ANY AFFINITY to the *old scholastic or common ideal theory*.

WHAT REMAINS to be said here will be equally important, to some readers, with what has gone before.—Professor Stewart, in the outset of his *Elements of the Philosophy of the Mind*, has justly enumerated two general causes of the neglect of philosophy. One of these, is the consideration already here discussed. Of the other, I beg to say a few words.—It is believed, that the *objects of philosophy are beyond the reach of the human faculties*. And it must be admitted that such has proved to be the fact, in a very lamentable degree, in the history of the subject. But the question still remains: Is this a necessary, or inevitable, result of its research? And another question arises;—namely—Is there now in existence any fact, or evidence, which revives the hope of the subject?—In answer to this, I must recall to attention my assertion, here, with a view to the French Philosophers, that *there are* *down upon the left side ;* and, at the same time, see another image-arm with the *left eye*, which arm moves *up upon the right side;* the two librating image-arms thus exhibiting a most beautiful display of recrossed vision."

" Any substance, or color, whatever, may answer the purpose of a Librating Rod for the experiment; though a metallic lustre is the best adapted for it. It, moreover, requires very little intension of vision, or tact in the experimenter, to gain sight of this phenomenon. And, from the moment it first appears, we may contemplate it steadily for any length of time; and may see it while we move the rod to a considerable distance from the nose; the *two image-arms*, instead of being extended in a line like those of the external rod, *appearing folded towards each other* and either *touching*, or *interlacing*, at every succeeding libration."

" *Experiment* 3.—Holding a yellow coin in an inclined position, at the distance of an inch, or two, with its edge toward and in front of the left eye, so as to present the appearance of a short metallic rod, Fig. 3; and a white coin, in a position to form a right angle with the former, at the same distance in front of the right eye, *Fig.* 4 ; the two coins being nearly an inch asunder ; and, then, looking at the two coins, one with each eye; I saw the two image-coins forming together a St. Andrew's cross, as represented by *Fig.* 5."

" It is to be remarked, that the images seen, in this case, are usually more readily discerned, than any of those in the experiments above described : and we can with the greatest ease, and continuance, remove the two objects to any distance from the eyes that our extended arms can reach, all the while continuing to behold the two image-objects crossed, as above described."

Now, as it is self-evident that the two real external coins, in this experiment, *do not cross* each other, *nor even so much as meet by the considerable distance of near an inch, or more ;* we have herein th [illegible] ree of cerby the same name) *do not mean color*ED images:—They do not mean the "*species*" of Aristotle, nor the "*ideas*" of Berkeley; neither do they mean *any things substantively different from the* MIND: On the contrary, they mean *occasional changes*,—i. e. MODIFICATIONS,—of the MIND ITSELF. *And this,* both Locke and Newton *asserted,* as legitimately as ever did Dr. Reid: though Newton, and Locke, sometimes also used the word "*species*,"—manifestly in the *same sense* that I employ "*color images*."

## DESCRIPTION OF COLOR IMAGES IN THE BRAIN, MORE CRITICALLY DESIGNATED RECROSSED VISION.

THE PROXIMATE intention, in publishing the result of the following experiments for the production of Recrossed Visible Objects, being that of annexing them, as a Supplement, to my previously-published Rationale of Cerebral Vision, to which they refer, and of which they will now form virtually an integral part; it happens that several passages in the original paper presented to the Royal Society, of which the present statement exhibits in great part a literal extract, would in the existing case prove little better than redundant, inasmuch as the substance of those passages has very probably been expressed in the Rationale itself. Such parts of that paper, therefore, are omitted here: And those now printed are marked by inverted commas, in order to distinguish them from any additional observations which the present occasion has appeared to demand. The extract, next immediately following this, expresses the leading passage of the paper alluded to, after duly addressing it to the learned body above mentioned.

"Although no doubt has existed in the minds of Anatomists that the Optic Nerves and Brain are in some way or other instrumental in the process of Visual Perception;

it is sufficiently known that there is not a more complete blank in Physiology than that which ought to contain a rationale of Vision within the head. It appears indeed that, since the attempts made by Sir Isaac Newton and Dr. Briggs, to account anatomically for the fact of single and erect vision, the matter has been considered as being hopeless: because any subsequent endeavors to solve the problems in question have not, I believe, been projected upon Cerebral, or Physiological ground; but have proceeded upon some supposed *external* principles; with the exception, only, of the hypothesis of Bishop Berkeley, which assumes that the Mind or Judgment, under the domination of the Sense of Touch, reverses the sentence of the eyes, and makes us see images as erect, that are in reality inverted."

After some farther preliminary matter; in the course of which, I adverted to my having detected the curious fact of the *duplication of the nose, seen in recrossed images*, the *left-hand image-nose* being seen with the *right eye*, and the *right-hand image-nose* with the *left eye;* the Paper proceeds as follows.—"To describe, now, for the purpose in question, the phenomenon of the crossed and duplicated nose, as forming the initial fact under which I shall follow out the subject; I observe that, one or other, of the two seen images appears very faint and shadowy, especially upon its first detection. This fault, indeed, mends a little after practice; and, in particular, if we wave the head laterally, to and fro, during the experiment. But the phenomenon, at best, never exhibits any degree of elegance: although it is inferior to none as an indubitable ocular demonstration of the *recrossing*, as well as of the duplication, of the seen images. The initial fact being once detected, however; the consequence could not long remain hidden. And I had hardly any leisure to reflect upon it, after the Rationale had passed out of my hands, before it became evident that, in all probability, it would be possible, by employing artifice, to arrive at the most vivid and precise phenomena of this class. Accordingly, I proceeded to try with a bit of white paper upon that side of the nose which, when seen recrossed, had appeared the most faint. And, after going through a course of experiments, which it would be tedious and of no utility to describe here, I found the following to be the most remarkable and fit to be recorded, as forming what I suppose may be considered the cardinal phenomena in the class of proofs in question."

"*Experiment* 1.—Having placed a gold coin on the left side of the nose, and a silver coin on the right side; both coins being placed near the lower end of the nose, and so situated that it was impossible to see the left-hand coin with the right eye—or the right-hand coin with the left eye; and managing the light so that each coin shone upon its respective eye, and the two coins so that the retinal image occasioned by each must fall upon the *outer side* of the retina as represented in the Plate, *Fig.* 1;—I saw the *yellow image-coin* ON THE RIGHT SIDE *of the white image-coin*, that is to say I saw the correlative places of the two coins *changed;* while, it is quite certain, I beheld the *left-hand image-coin* with the *right eye*, and the *right-hand image-coin* with the *left eye;* the nose being interposed, as it were a mountain, between the two eyes, and rendering any deception with regard to the fact impossible; while the *different colors* of the coins rendered the identification of each of them the most certain that could be imagined."

"*Experiment* 2.—In this Second Experiment, the introduction of motion produces the most striking results in the phenomena.—Holding a short, bright, metallic rod, about an inch and a half in length, horizontally, with the centre touching the point of the nose, *Fig.* 2; and, then, making the rod swing up and down, as if it librated on its centre; if we look at one arm of the rod with each eye, we shall perceive, in the most vivid and precise manner, that when the *right arm* of the rod moves down, we see an image-arm of it with the *right eye*, which image moves

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If the distance of the objects from the eyes were increased, beyond that mentioned above, the two retinal images (*i. e.* one in each eye) must *begin to coincide, or correspond;* and so, at length, if both eyes were equally effective, the two half faces would *club into one unmeaning mass.* It is owing to this dioptrical law that we are saved from seeing distant objects, preposterously, on exchanged sides: which would always happen if those objects were near the eyes, and in certain lines of bearing.

With regard to procuring proper *External Subjects,* for the described experiments ; I may here intimate that, the *identical figures* on the Plate, given at the end of this paper for illustration, are sufficiently adapted to the purpose. Thus, If the extremity of a spectator's nose be applied in contact with that of the sketched nose—Fig. 1.—he may, with the least tact, see the two image-coins on exchanged sides, and may *read* the word *Silver*—and the word *Gold*, thus transposed.—And, if the end of the nose be applied between the *Two Half Faces*, in the *Notch* of the card; the spectator will, infallibly, see the ***Halves transposed*** into a ***Proper Whole Face.*** The Image-Objects, of course, ***always appear as if they were upon the nose;*** or, else, ***in some other*** EXTERNAL place. But every one, who has the least smattering of Optical Science, knows that they are ***transposed in the Brain, and exist nowhere else;*** their transposition *any where anterior* to the retinæ of the eyes being dioptrically impossible.

It may not be without its utility to hint, here, that, upon this Principle, those who may be interested in Optical, or Spectral amusements, may easily, by means of eye-tubes and other adapted adjuncts, produce a variety of changes in the relative situations of *Image-Objects:* all of which would prove curious; and some, in no small degree, ludicrous. Nor let it be thought that this hint is altogether puerile, or derogatory to the subject, unless any one will undertake to inform us, with certainty, that *no advance in Science* can ever result from the prosecution of such inventions. We need not go so far, as the alleged invention of the Telescope, to learn that, the conversion of a discovery into an amusement may lead to the conversion of an amusement into a discovery. The fact that, the Seen Images of any two external objects, duly depicted on a card, *are not only seen on exchanged sides in the brain;* but, *also, may be made to librate up and down, in contrary directions towards each other,* upon the principle of the ***turned and reversed arms of the librating rod whose images appear thus reversed,*** may afford a hint for the production of varieties; of which, some idea may be formed from viewing the *contending Image-arms*

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But, whatever fruits may be reaped from such devices on the score of *amusement,* or, even, of farther discovery; it must be strongly pointed out here, for philosophical consideration, that the PRINCIPAL delight they can afford, to persons of competent intelligence, is in the CONTEMPLATION OF THE FACT THAT HUMAN BEINGS, (and, of course, other animal beings, deducting however for their want of reason,) ARE THUS CONSTITUTED; *and that, by means of this Constitution, the* MIND, "IN ITS DARK CHAMBER THE BRAIN,"—(that dark chamber which has brought upon the immortal Newton such pointed ridicule, for his believing that it could contain any such images,)—continually, or from time to time, beholds,—IN IMAGES MADE OF SENSATIONS OF COLORS,—A FAC-SIMILE OF THE EXTERNAL UNIVERSE; or, at least, of a *certain extent* of it. This being a fact, established now by a great redundancy of proof in the Variety of the Phenomena; I shall close this Print by extracting a part of the concluding paragraph of the original paper.

The whole Series of Propositions, that constitute the little Treatise, which I ventured to call a *Rationale of the Laws of Cerebral Vision,* published previously to the Supplement now affixed, and this Supplement taken together, form one continued demonstration of the truth that, *Over and above the gift of Two External or Cranial Eyes,* man has, by his Adorable Creator, been endowed with an *Internal and Cerebral Organ which performs the office of a* THIRD EYE by being the *Common Recipient* of impressions, propagated either from one, or from both the Cranial Eyes. And that, the Mind, *in its presence-room, perceives by means of Images; and steers with regard to* External Objects on the same Principle as the Captain-mariner, sitting below in his Cabin, perceives, by means of his *Mariner's Compass,* that his Ship is steering toward the Pole, or in any other direction.

## STRICTURES

### ON THE ABSTRACT OF THE PAPER ON RECROSSED VISION, PRINTED BY ORDER OF THE ROYAL SOCIETY.

THE ABSTRACT, above entitled, after announcing the title of the paper in question, runs as follows.—" The " phenomena described in this paper, and which the " author designates those of *recrossed vision,* are cases in " which objects placed between and very near the eyes, " such as the two sides of the nose, appear on opposite " sides of the sphere of vision; the object on the right side " of the nose being seen to the left by the right eye, and " that which is on the left of the nose being seen to the " right by the left eye. These and other phenomena " illustrative of the well-known law by which we estimate " the position of objects with relation to the eye to be in a " line drawn from its image in the retina through the centre " of the eye, are considered by the author as requiring " farther explanation. Not satisfied with the theory of " Berkeley, that the mind is guided by the perceptions " received from the sense of touch, in interpreting the " signs furnished us by the sight, the author proposes to " explain these phenomena by an hypothesis of his own, " which he states in the following words." Here the abstract ends with a correct quotation of what I have said concerning the " *Cerebral* or *Third Eye* :" which, however, the functionary degrades by the title of an " HYPOTHESIS ;" and which it certainly is if all the demonstrated dioptrical laws of light are to be called hypotheses. But, of this in the sequel.

DESIRING any thing rather than to comment with dissatisfaction, upon an abstract put forth under the sanction of the Royal Society; and, the more so, considering the Gentleman who communicated the paper thus reported, who, I am satisfied, has with punctilious honor discharged his duty to the subject in that, and in every respect; I find it nevertheless impossible, with justice to the Royal Society, to myself, or the science concerned, to refrain from stating the following remarks: because, besides every consideration of personal interests, it will appear that some very material, though secondary, features of Optical Science are at issue.

First, then, Laying aside that I had expressly mentioned the phenomenon of the "*duplicated nose*" as being *only the initial fact which served as a clue* to the far more impressive phenomena of the *recrossed coins*, and *recrossed syllables*, and *recrossed arms of the librating rod;* upon all which I placed the *principal* interest of the paper. And acknowledging, here, that the phenomenon of the *recrossed nose* is recognised with effective truth, with exception of the phrase—"*opposite sides of the sphere of Vision;*" I must remark that this phrase, although it expresses no fallacy, has certainly the *effect of concealing the fact that is vital to the subject*—namely—that the phenomena are recrossed IN THE BRAIN. For it is sufficiently known that not one of the disputants, concerning the *immediate organ of vision*, ever dreamed of assigning to that organ *any seat within the head;* and, therefore, whether the "*sphere of vision*" be taken to mean the *hemisphere of external objects* embraced at one time by the eye, or the *field of vision seen in consequence*, it is certain that no Optical reader could suppose that the expression—"sphere of vision"—means a sphere *in the brain.* The fact, therefore, is by that phrase concealed from the public; when a single word would have conveyed it to philosophers. To this I may be allowed to add that the subject is introduced, in the abstract, with *no word of connexion* acknowledging that it is new in KIND—

a department of science never before entered upon. And far less is there any hint given, that it had been attempted by Newton. In a word, the subject is slipped in, as if it were some very trifling increment of advance in a science already known; a procedure which, however, I mention chiefly as showing the *aspect* with which the thing has been looked upon, and which will appear more decisively from what follows.

When the abstract, after its manner of recognising the fact of recrossing, goes on to say—" These" (which means my own witnessed phenomena) " and other phenomena illustrative of the well-known law," &c.———" are considered by the author as requiring farther explanation;" the expression is an absurdity which could only have proceeded from the greatest negligence. Deducting, however, for the confusion in the passage; the meaning of the functionary, who composed it, is no other than to assert that my phenomena are " illustrative of the well-known " law by which we estimate the position of objects with " relation to the eye to be in a line drawn from its image " in the retina through the centre of the eye;" but that, *I consider that law as " requiring farther explanation."* What, then, will be thought when I declare that this assertion is an egregious mis-statement of *what I did expressly and at great length consider* in the Rationale, fully evinced in the paper in question?

Nothing is more certain than that, sometimes, a man's proofs, or arguments, are found to make against his theory. And, as the functionary assumes that mine do so, he was certainly entitled to assert this, though on the stake of his scientific responsibility. But when, in addition to this, he went on calmly to assert that *I consider the law in question as requiring farther explanation;* though it is one of the principal features of my labor to lay out a set demonstration, with varied illustrations, that the *principle is false and exploded;* I have no choice but to ask,—Is this the way in which a functionary of the National Scientific Institute ought to use the power confided to him, to report with fidelity, and doubtless with some scientific knowledge, the contributions of men who have worked out their lives for the enlargement of science?—Is the misstatement not one that, to the readers of the Abstract, there strangles my refutation of the principle of the *line drawn?* In order, now, to show *what I did* consider; and, at the same time, show that *what I did consider is true science;* I state, in the first place, that the 19th and 20th propositions of the Rationale are laid out to demonstrate at great length, including its illustrations and adjuncts, that the principle of the *line drawn through the centre of the eye* is fallacious and altogether visionary. And I venture to believe, not only that this will never be disputed; but that, every philosopher, who reads that proposition, will admit it contains matter which claims his interest. It is, of course, impossible to do justice to the subject without referring to the two propositions in question; which are entitled thus:—"*Of External Direction, as a Principle Extraneous to Vision.*"—"*Of the Visual Principle of Coincident Images,—involving the Problem* HOW *the mind steers.*"—But the following extracts will serve the present purpose.—The refutation of the principle of the line drawn through the centre of the eye, I have stated as being *virtually the same* with Dr. Potterfield's principle of *a line falling* PERPENDICULARLY *upon the retina, at the point of impression.* And Dr. Reid has expressly acknowledged that they are nearly the same thing. And, in the conclusion of the proposition (the 19th) I have said—"As the last consideration which I shall adduce "here; it may be observed that, when we bend an eye "upon any field of vision; all the objects in that field, "which impress the eye at *any distance from the axis of* "the eye *greater than about a third part* toward the "pupil, must impress the retina with an *obliquity so* "*great,* that it is astonishing how any person could over-"look so obvious a fact. And yet, Dr. Reid not only

" avows Dr. Potterfield's principle of Perpendicularity, as " being a *connate or original law of the mind;* but also " says, he ' *honors him for the discovery.*' "

Here, however, by the way, if I recollect rightly, Drs. R. and P. are *opposed* with regard to the NATURE of this law: Dr. Potterfield considering it to be the result of the *line of direction of a ray of light:* whereas Dr. Reid has shown from experiments, with irresistible force, that, *in whatever direction* a ray falls upon the retina, we see an object *in the same direction, provided the* SAME POINT OF THE RETINA *be touched.* And this fact proves, with equal force, the truth of the Principle of Coincident Visual Images, here to be farther noticed.

To these references to the Rationale, I now add that, at this moment I am looking, with my right eye, at a chair in front of the eye; the image of which chair falls on the centre of the retina: And, at the same time, with the same eye, I see another chair, so far to the right (*nearly at a right angle*) that the rays of light coming from it *barely* enter the pupil, and *fall upon the retina of the eye with the greatest possible obliquity to it, and at a very little way* FROM, OR BEHIND, the outer edge of the *cornea.* Therefore it is certain that the line from the second chair, to its image on the retina, does not by a great distance, *pass through the centre of the eye:* And equally certain that it *does not* (as Dr. Potterfield thought) *fall* PERPENDICULARLY *on the retina.* If the functionary, who has staked his scientific reputation to the assertion that *my phenomena are " illustrative of the law of the line drawn through the centre of the eye,"* will refute this, and other such facts; I wish him all the success that the truth of science can afford him: and I should be happy, at the same time, to be favored with his name.

Having now stated nearly what may be sufficient, both as to *fact,* and to *science,* concerning the abstract; I here address every one, who would hold the Royal Society in respect; and ask,—After such a series of dioptrical reasonings, confirmed by such ocular proofs, that Visual Impressions are recrossed in the brain ; Was it competent for its functionary to represent me as being *only* "*Not* "*satisfied with the Theory of Berkeley that the mind is* "*guided by the perceptions received from the sense of* "*touch, in interpreting the signs furnished us by the* "*sight ?*"—Was it competent for him to assert that I *only* "*propose to explain the phenomena by an hypothesis ;*" and, thus, to stigmatize my labor as a thing unproved, or doubtful? Or, Will the functionary commit his scientific judgment to an open demur, asserting that the impressions are NOT recrossed in the brain ; or that any other supposition makes against it ?—But, above all, Was it competent for the functionary mis-statingly to declare me as considering the *principle of the line drawn, &c.* "*as requiring farther explanation ?*"*—Was this the *fidelity,* any more than the enlightened liberality, or the scientific tact (*supposing the want of the last was real*), with which the detection of *Vision in the Brain, involving all its consequences,* was fit to be notified to Europe, by an Abstract under the sanction of the NATIONAL INSTITUTE of that Country in which Newton brought colors to light ?

When the case, (now in great part stated,) is considered in addition to that given in the Preface ; Let any ingenuous person pronounce, What course remained open to me, or to the subject thus obstructed, but an appeal, such as is here submitted ?

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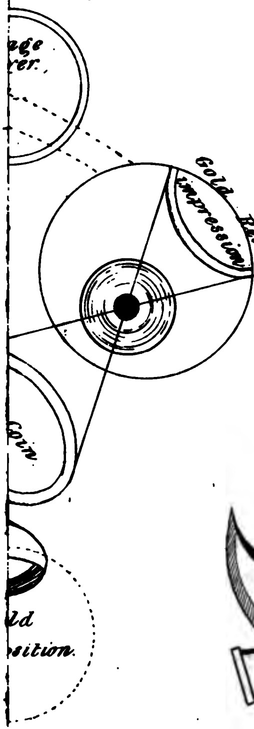
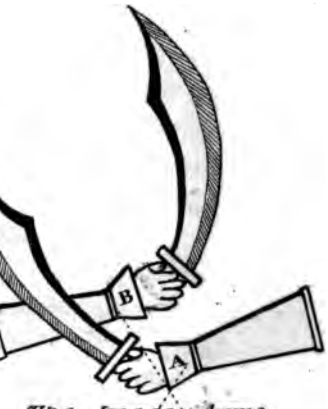
* My words, in the paper to the Royal Society, are these :—"The Visual Principle of Coincident Images, which, I conceive, is rigorously demonstrated, and largely illustrated, in the 20th Prop. of the Rationale, and which involves a train of consequences," &c. Does the mis-statement, and consequent concealment of that announcement, not keep an important feature of the case out of sight ? And, What was the Cause of the imagined words that did this ?—Let the proper Judges decide. I judge it not, as I suppose the functionary can explain.

change sides in the Brain.





The Image Arms reversed in the Brain.

Fig 2.

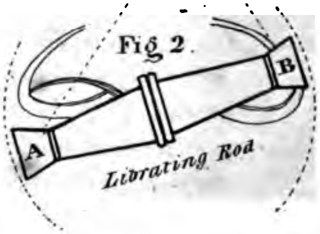


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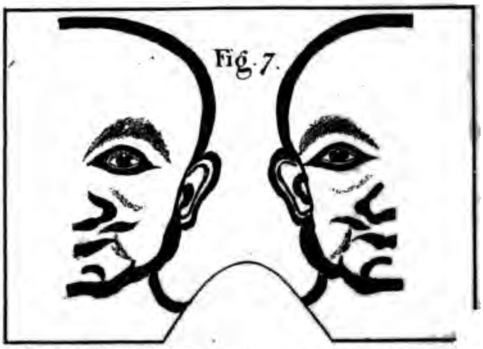
Fig. 7.



Transposed in the Brain to a proper whole Fa

rate Color Images in the Brain.

P. Cartwright Lith.

# ADDITIONAL PHENOMENA WITH ONE EYE.

ALTHOUGH it is manifest that the adaptation of the Single Eye, or of its Optic Trunk, to recross, and rectify its own retinal impressions, is most important, and altogether vital in the Machinery of Vision within the Head, inasmuch as that adaptation constitutes *one half* of the Visual Mechanism when we see with ***both eyes***, and ABSOLUTELY THAT WHOLE *Mechanism as often as we see with* ONLY ONE EYE; I had considered this function of the single eye so completely demonstrated in the 22nd Prop. of the Rationale, as not to have afforded it an after-thought. But, in adverting to this function in page 38 of the present Supplement, it occurred to me that the demonstration of the recrossing of the two ***image-pins' heads*** (however certain) constitutes a rationale of considerable dioptrical subtilty, it having escaped the research of Drs. Reid and Potterfield; and as, at the same time, the facts of recrossing in the case of the ***two contacted coin edges***, and of the ***ribs of the leaf***, being facts of ***very minute subjects;*** it would be desirable, if we could demonstrate the fact upon a ***larger and more obvious scale***. Upon this, it struck me to try an experiment; which I am now greatly surprised I could have omitted before, but which omission certainly arose from my feeling of security on the phenomena already adverted to. The simple artifice, whose result I now announce, is that, upon trying ***throbbing pressures on the opposite sides of the ball of the*** SINGLE EYE, I had the instant gratification of seeing TWO PEACOCKS' FEATHERS, ***on the opposite sides of that eye:*** And, upon making the ***throbbings change their places, all round the eyeball, the two circular objects constantly obeyed the law of recrossing;*** the ***throbbing on the right*** side producing the ***object on the left*** in the eye; while the ***simultaneous throbbing on the left*** produced the ***object on the right;*** precisely as happens in the case of the similar process performed upon BOTH EYES, as already duly described.

It has appeared to me that, so broad, and obvious, and even popular, a species of proof of the recrossing functions of the Single Eye, ought not to be withheld on the present occasion, since it so remarkably establishes the Mechanism of Vision within the Head.

If, as is certain, the adorable wisdom of the Creator is eminently displayed in the mechanism of the *Eye itself*, including both its dioptrical and its nervous apparatus; How vastly is the display of that wisdom magnified, and multiplied, in the single, and the double, mechanism within the head; in which, ***by the medium of marrow cords***, the impressions of one, and of both eyes, are made to ***recross***, to ***rectify***, and to ***harmonise!!!***

# OF COINCIDENT IMAGES

## AS THE PRINCIPLE OF THE DIRECTION OF OBJECTS.

As the refutation of the supposed principle of the "*line drawn through the centre of the eye,*" constitutes only one half of the *desideratum* on the subject; And as the principle of *Co-incident Images* is that which I have laid out in the Rationale, in order to propose for it; I shall embrace this opportunity to add a gloss to the details of the matter as expressed in that Treatise, especially since it is proper, for the sake of those who may read this Supplement without the Rationale, to afford some notion of the Proposition which the Abstract, already considered, has, by its silence and opposition, nullified, as presenting not a point worthy of consideration against the principle of *the line drawn through the centre,* &c. No more, however, can here be attempted, than a *gloss:* For the proposition, with its various illustrations, occupies some space in the Rationale; and it must be referred to, in order to form any adequate conception of the whole principle.

The essence of the matter then is that, it having been demonstrated, throughout, that Visual impressions are recrossed in the head; it was thereby demonstrated that *there are* TWO FIELDS OF IMAGES employed in the process of vision—namely—a *field of* IMPRESSED IMAGES IN THE EYE,—and a *field of* COLOR IMAGES IN THE BRAIN. This being a fact proved beyond any attempt at denial; it followed accordingly—*that is it followed in an actual ocular induction of the fact,*—(which I have given at length in the place referred to,—) that *every point* of the field of impressions in the eye, *corresponds* to *a point* in the field of Color Images in the brain : And, hence when, for example, any object impresses *a point in the middle of the retinal field;* this point COINCIDES with the *middle point of the field of Color Images :* And, when any point on the *extreme left of the retinal field* is impressed; this point COINCIDES with a point in the *extreme left of the field of Color Images:* And so on, throughout the whole field of retinal impressions.—In order to illustrate this PROVED FACT, I explain that, an impression in the retina of the eye is analogous to a *landscape cut in relief* upon a board placed *vertically in the eye;* and the *Color Images,* consequent upon this impression, are analogous to *the same landscape* PAINTED *upon a* SCREEN *placed behind, in the brain, and parallel to the board in the eye.*—If, now, I were to connect every image in the *forefield* with the correspondent image in the *after field, by lines of nerve,* or of *light;* of *ether,* or of *electrical matter;* either of these media might be no improbable thing: *but, the thing would be* " AN HYPOTHESIS ;" and I challenge the Author of the Abstract to show that there is *any such hypothetical link, in the whole chain of the Rationale and the Supplement taken together.* But when, on the contrary, I assert *merely that there are* TWO FIELDS of images ; *one in the eye, and another behind, in the brain;* I assert a MULTIPROOF FACT, and therefore I cannot but complain that it appears oppressive,* in a national functionary, to use his power to stigmatise a fact so proved, by calling it *an hypothesis.* The fact, however, being above controversy ; and as all optical writers agree to call the retinal impressions " images ;" while color images are certainly images; I have therefore called the principle in question the "*Principle of Co-incident Images.*" Accordingly, in the close of the paper presented to the Royal Society, I have repeated what was said in the Rationale; where I expressed it *as being the result of the whole continued series of proofs, first and last*; and which the Abstract has quoted, correctly indeed, but as a mere supposition which it appears to estimate light as air—namely that —" Over and above the gift of two external or cranial eyes, " man has been by his Adorable Creator endowed with an " *internal cerebral organ,* which performs the office of a " *Third Eye,* by being the common recipient of impressions " propagated, either from one, or both of the external eyes; " and that the mind, in her chamber of percipience, steers " with regard to external objects, by the same principle " on which the Mariner steers by his Compass. Thus, the " two cranial eyes are analogous, in principle, and situation, " to two Magnetic Compasses placed upon a ship's deck; " while the third, or Cerebral Eye, corresponds to another " compass placed in the cabin below: And the mind, situated like the captain mariner in his cabin, knows, from " consulting the Cerebral Eye, upon what point of direc" tion the body is steering; although the Mind no more " perceives either any external object, or yet any image in " the cranial eye, than the mariner perceives, (even in the " vulgar sense of the word perceiving) the far-off land, or " haven, towards which he is surely making his way."

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* I say oppressive : because, *as few words* would have expressed, in the Abstract, (*at my proper hazard,*) my declaration that the thing in question is a *proved fact.*

Upon this result, I now offer the following gloss: though I think it is already indicated in the Rationale.—Every Spectator of a scene *must allow*—(*and nature has well taught him how to do so*)—for the VARIATION OF HIS EYE, as the mariner allows for the *Variation of his Compass.* Thus, if a man know that his head is twisted far to the right, and his eye twisted far to the right in his head; he then knows that the object he sees is *nearly behind him*: And this he does on the very same principle that the mariner, when he is steering *North by his compass;* and knows that his Compass has "*Two Points*" of West Variation; knows that he is *not steering North*, but is steering "*North North West.*"

It was not to be doubted; On the contrary, it was altogether fit, that the scientific world should view with rigor a matter so little anticipated as this proved structure and office of the Brain; and should oppose it, accordingly, if room appeared for such opposition. But, as the supposed principle, of a *line drawn through the centre of the eye*, has been entertained by *Optical Philosophers in general;* (and accident might have made me, or any man, give into that opinion;) it is certain that *no one* philosopher need feel any particular reluctance to acknowledge its refutation. And it may be calculated that no liberal mind, so situated, will give into an unfounded and disingenuous opposition. I leave it now, without the least anxiety, that the *facts, when understood, and made at all familiar, are* TOO PLAIN AND HOMESPUN to admit of their being withstood. Nor have I met with any *express* opposition, or any sign of controversy, in any quarter; with exception of that virtual strangulation of the subject, in the silence and the otherwise-implied dissatisfaction of the Author of the "*Abstract*:" which dissatisfaction, I think, that Author will not follow out, under his name.

## RECROSSED VISION WITH A SINGLE EYE.

In the Quarterly Review for July, 1831, there is an account of a Work by Dr. Abercrombie, "*On the Intellectual Powers*:" in which is recounted the affection of one, *and both*, of Newton's eyes, from a misuse of them in looking at the sun. This affection the author naturally conjectures is to be accounted for on the *principle of the decussation* of the optic nerves,—a conjecture not new, but *no proof* of which had been fallen upon until the detection of recrossed vision. But the Author in question, as others have done before him, supposes that the MEDIUM by which the *second* eye becomes affected, in consequence of a visual derangement of the first, is SYMPATHY. Now, as this conjecture, of a visual principle of sympathy, has thus been adverted to in a channel of such extensive circulation and influence as the QUARTERLY REVIEW: and this, too, about the time of my publishing the detection of recrossed vision: it appears requisite that I should say a few words here, in order to show that the principle of sympathy is out of the question in producing the recrossing of images; and this, not with a view to the Author in question; but to prevent its proving a stumbling-block, in the subject, to any reader, of any part of it.

*First,* then, The recrossing and rectifying of the images within the head is a fact proved to be *mathematically necessary,* through a series of dioptrical propositions; and is *afterwards proved to be real,* by full *ocular demonstration.* And, besides these combined proofs; I urge that, upon inspecting Figure 7 in the plate, it is conclusive that *sympathy, if it existed,* could only make the optic nerve of the *second* eye produce *another half face, a copy of the half face seen by the first eye;* and it could never produce a *proper whole face,* as we see it does. This fact is so conclusive that, I feel confident, no philosopher of name will place himself in the situation of denying it.—Again, in the phenomenon of the *Librating Rod;* SYMPATHY could *not reverse the arms of the image rod:* and, far less could it make the reversed arms *move up and down, in contrary directions, passing and repassing one another.* It would be an affront, to the understandings of optical adepts, to enlarge upon such proofs of the fact that visual impressions are recrossed and rectified *by a mechanism and structure of the nerves, purposely contrived* for this recrossing.

But the subject *does not admit* of my stopping here: For the proofs, now adverted to, form in fact but *one half, or one species,* of the existing proofs of the matter in question: because the 22d Proposition of the Rationale is laid out under the following title—namely—"*In the* "*case of Vision with a Single eye, the Retinal Images of* "*Objects are recrossed, after their inverted formation on* "*the Retina, and are made erect posterior to that* eye." And, in that proposition, illustrated by the first Plate, figures 3, 4, 5, 6, 11, it is *demonstrated* that the *duplicated pin's head*, seen with one eye; and the *interlaced edges of* the *two* coins;—and the *interlaced ribs of the leaf;* —are, all of them, *facts of recrossed vision with a single* eye. It hardly needs be said that no one will ever pretend to attribute this recrossing, *in the single eye*, to SYMPATHY; or, *deny it to* MECHANISM.

Finally here: Upon this function of the Single Eye, *or Trunk*, to recross its own impressions, I offer a hint to *philosophical anatomists of the brain,—a mere conjecture,* —which I utter only because I am by various causes prevented from working farther on the subject; (IN WHICH, HOWEVER, MUCH REMAINS TO BE DONE;)—namely—that the *retinal impressions are recrossed* IMMEDIATELY ON THEIR EXIT *from the eye to the optic trunk,—perhaps in the button,*—and are *rectified, at once, in the trunk*, forming an IMPRESS IMAGE IN LITTLE;—which impression travels along the optic trunk, and is *re-expanded previously to its discharge* upon the perceiving mind. I shall not offer a word here, in support of this conjecture: *which,—and which only* in the present labor,—the functionary of the Abstract is welcome to refute *as an hypothesis;* though I offer it here *only as a mere conjecture, in order to stimulate research.* It is at the same time certain that, *this;* and the MANNER, *and the* PLACE, of the CORRESPONDENCE OF THE RECROSSING *when* BOTH *eyes are employed*, are very beautiful problems; and the last a most important one; to be solved.

It cannot be doubted, by those who have read this statement, that any man, of competent knowledge, and high feeling, who has, from haste, or negligence, mis-stated my labor, or miscalled the subject; and has seriously impeded its reception, by representing it as at best questionable, and in part contradicted; will be anxious to explain the matter, for his own honor, and for the advancement of science. While I announce, (and this with no feeling but a desire that right be done,) that it is equally my duty and my determination to remove this obstruction, by doing what I had hoped the Royal Society of the Country, if not other Scientific Organs, would have done for me, in placing this Supplement and Case in such channels as must find for them the adjudication of Europe. In so doing; the first appeal is, of course, due to the Royal Society.—And I now respectfully beg to lay the matter before His Royal Highness the President, and the Council of that illustrious body; with the hope that, in its wisdom, it will extend protection to, and not suffer any accident drive the Science of Vision within the Head, to owe to the philosophers of a foreign land for that first public recognition which ought to belong to its native country.

N.B.—*The Paper, presented to the Royal Society, is dated September 8th,* 1830:—*And this Supplement is published September 26th,* 1831.

### OMISSION IN PAGE 36.

Where it is said—"a conjecture not new, but *no proof* of which had been fallen upon until the detection of recrossed vision,"—it ought to have been added,—*Nor is any proof* of the matter afforded by recrossed vision: because, it seems even a much more probable conjecture that *each optic trunk carries its own* impressions on *beyond the meeting* of the two trunks; and perhaps expands *each in its own* THALAMUS; in the *thick mass* of which last it *may be* that the retinal impressions of its own eye are *recrossed.* For this reason, the two *Image Coins* of Fig. 1., which *appear* as if recrossed *by the crossing of the nerves,* may not be truly represented; though this could not be helped in the present state of the subject.

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# THE

# HUMAN SENSORIUM

## INVESTIGATED AS TO FIGURE

By a course of Pressures on the Eyes; and by the induced Phases and Bearings of those Sensations of Colors called Peacock's Feathers; being a Second Supplement to the Rationale of Cerebral Vision.

BY JOHN FEARN, ESQ.

> " When a man in the dark presses either corner of his eye
> " with his finger, and turns his eye away from his finger, he
> " will see a circle of colours like those in the feather of a
> " peacock's tail."
>
> SIR ISAAC NEWTON'S OPTICS.

> *" And these things being rightly despatched, Does it not*
> *" appear from the phenomena that there is a Being, incor-*
> *" poreal, living, intelligent, omnipresent, who, in infinite*
> *" space as it were in his sensory, sees the things themselves,*
> *" intimately and thoroughly perceives them, of which things*
> *" the* IMAGES ONLY, *carried through the organs of sense into*
> *" our little sensoriums, are there seen and beheld by that*
> *" which in us perceives and thinks?"*
>
> SIR ISAAC NEWTON'S OPTICS.

LONDON:

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# PREFACE.

THAT Visual Modification of the Mind—in other words that Circular Mass of Sensations of Color—which has by Sir Isaac Newton been likened to "*the feather in a peacock's tail,*" is a phenomenon which opens to us a road to the investigation of the nature of the Sentient Subject that never could have been afforded by vision from Light, since it is impossible that light, reflected from external objects, can be made to fall upon the eye so as to impress the retina upon many of those points, which it is necessary to impress in order to induce visual phenomena in the situations, bearings, and mutations, which alone can indicate, in any extent however small, the *Physiological Condition or Figure* of the Sentient, the investigation of which, as far as may be done from certain data, is the purpose of the present supplement.

At the same time, it claims remark here, as an important example of oversight, to what an extent this species of vision has been neglected; while its existence is so obvious, and even so obtrusive upon the notice of all men, that scarcely any human being can be altogether ignorant of the fact. The case of Sir Isaac Newton; and that of Dr. Porterfield, who wrote so largely on Vision, and who held as strongly for the existence of a *Sensorium,* against the denial of it set up by Dr. Reid, as Newton himself would have done had he been in life; would have appeared to me almost impossible, were it not that an equal extent of neglect has happened in my own case, during twenty years after I had actually experimented a course of *general* pressures on the eyes, with a view to determine the physiology of our visual sensations; at which time, I was perfectly aware of the *existence singly taken,* though I never thought of seeking for the *plurality or multiplication,* of the peacock's feather.

Some good may be derived from the fact, now adverted to, if it serve to render future inquirers vigilant against similar oversights. At any rate, the cause, in all the cases, has in all probability been the same. Neither Newton, nor Porterfield, had any view toward the Figure of the Sensorium, especially not through the medium of VISION; they, certainly, not suspecting that any road was open to such an investigation, unless through ANATOMICAL research. And my own view, at the time of my employing the general pressures abovementioned, was equally without any such anticipation; my object at that time being confined to a demonstration, or proof, of the *Extension only* of the Sentient, by proving that of our visual modifications. It may have happened, however, in both, or one, of the other cases; or, at least, it may happen on some future occasion; that an Experimenter, unless advised on the subject, might be deterred from the research by a fear, or reluctance, to tamper with the eye. On this account, I deem it proper to intimate that, although I have experienced some forbidding effects of looking *much at strong lights*, and otherwise from *straining the eye in any way with looking at all;* (any of which cases is likely to happen only when some act of *external* vision is going on;) the result of pressures with pins' heads on the eyes, employed with intervals for hours in the day, and repeated daily for weeks, and even months,—has been wholesome, or improving, to my own eyes; one of which has always been rather weak, and very dim sighted. It is probable, I have persevered in this course to an extent which few; (and, certainly, no one but an earnest lover of inquiry into the nature of his own mental constitution,) will care to imitate. But, from employing the pressure short of pain; and desisting when the eye became unduly moist, or in the least degree irritated; I have experienced no bad consequence from the practice, but, I think, benefit.

From the tenor of pages 162, 163, of the Rationale, it will appear that I therein contemplated an additional Section to that work; having for its object to trace the farther nature of the Sentient, especially with regard to its Figure and Seat. The state of health, however, which obliged me to terminate the Rationale abruptly, and my being subsequently engaged in the detection and investigation of Color Images in the Brain, have prevented, until now, my resuming any serious attention to this object. Having, in the Supplement on Color Images, expressed the probability that the farther prosecution of the subject must be left to some other hand; I have deemed it proper to explain here, as above, in order that it may not be thought capricious that I have thus resumed it.

In what has on this occasion been effected; I presume it will appear that *another stage* has been added to the knowledge of our Sentient Constitution, beyond that of the existence of Vision in the Head. And whatever may be judged of the completeness, or want of completeness, of the investigation, as far as concerns the FIGURE of the Sensorium; I apprehend, the way is laid considerably open to the inquiry concerning its SEAT; and that, Philosophers are called upon to follow out the subject.

Any additional investigation with regard to the *Figure* of the Sensorium, (and the same perhaps applies to its *Size*;) must, I conceive, be conducted in the way which I have thus far prosecuted,—namely—upon *Pneumatological* ground. But any inquiry with regard to *Site*, I should imagine, will have to proceed upon ground purely *Anatomical*.

*London, March 12th,* 1832.

# PROPOSITION I.

*Vision from Pressure and Vision from Light are specifically identical in themselves and in their cause.*

Besides its bearing upon the inquiry concerning the Figure of the Sensorium, Vision from Pressure has decided another question, which had hitherto been a desideratum as near the foundation of the Physiology of the Mind as that just mentioned, and one which it was necessary to settle, previously to any other step in the direction of mental physiology. The question in itself, together with all that it involves, was no less than whether all our Sensations, occasioned by the several external organs of sense, are of one same genus: Which, if answered in the negative, or only left in doubt, would *mystify* the physiological conditions of the mind, and leave us in an uncomfortable hopelessness of ever being able to advance our knowledge on the road we are now following.

It is sufficiently known that this uncomfortable prospect has been held out to Pneumatologists, in the set attempt of Bishop Berkeley to prove that Extension and Figure perceived by the Sight is not of the same kind with that perceived by the Touch. While the condemnation of that attempt even by Dr. Reid, in addition to the creed of Newton, has not been sufficient to prevent the mischief of Berkeley's Hypothesis, in producing a great Schism on the subject.

The Hypothesis of Berkeley has been opposed by others, and myself, on different occasions, with arguments which I deem to be altogether conclusive: but those arguments, being rather *speculative* than *practical*, were not of that species which could *force* assent, in a case peculiarly obnoxious to prejudice and bias; in which, the subject being a question of *fact*, it is not sufficient to *plead what in reason must be*, but it is required to *prove by phenomena what actually* IS.

The known existence of the phenomenon called the Peacock's Feather as described by Newton; in that single phase of it which alone had then gained the attention of Philosophers; proved no bulwark against the distracting hypothesis in question: For, standing alone, it might fairly have been supposed to be only a preternatural, or morbid visual affection,—a mere anomaly in our visive constitution—not capable of being traced to general laws, or a system of vision. In a word; Newton left the subject as a *query*, for future discussion. And, accordingly, it has been so treated by Berkeley. On this account, the immediately following description of the phenomena of Peacock's Feather, in a variety of phases and bearings, (besides referring to those already described in the Rationale,) seems proper in order to establish both the *legitimacy and the competency* of Vision from Pressure, for the purpose of determining the physiological condition of the Sentient, in so far as regards its *figure.*

*First.*—We can occasion *several*—that is *two, three, or more,* Feathers simultaneously, from pressure on a *single* eye,—the Feathers always exhibiting *correspondent arrangements of locality,* to those of the pressures.

*Secondly.*—We cannot increase the number of Feathers in a single eye: But this limitation appears to be accountable. Pressure, by even the finest practicable pointed instrument, is a cause of vision so almost infinitely more gross than the impulsion of light through the pupil, that the former must be expected to derange, and exhaust, the visive functions of the retina. And we are at the same time to observe that the *size, or shape,* of a seen Feather, is not that of the pressing instrument; but it is that of the *circular, or other-shaped flexure* which the point of the instrument occasions, and which may vary in *size,* from a quarter, to a half of an inch, or more, in diameter, or length. It is not from want of room on the retina, nor yet in the Sentient, that the number of Feathers cannot be increased: nor is there any want of capacity to occasion *two* feathers *very near each other;* or, even, to throw the one upon the other, partially, or wholly. But, beyond the number of three, or four, the power of producing these objects, *simultaneously*, is by some means exhausted. It, however, hardly appears that we are materially concerned in being able to assign the precise cause of this, since the *correspondencies between the Pressures and their consequent Phenomena* are all that seem to be essential to our purpose.

*Thirdly.*—As we can hardly manage so clumsy a process, as that of pressure, in any way so as to occasion flexures on the eye of any other shape than *one*—namely, *circular indentations;* this one shape must serve us in nearly all the experiments we can employ in the investigation. But it is curiously satisfactory that we can *modify this in some degree;* although, even if we could not do this, the fact of *figures formed by the arrangement of several* Feathers, simultaneously in the Sentient, would render any figure of *any single* Feather, or Object, an evidence not in the least requisite for establishing the desired result. Thus, upon pressing on the eye with the edge of one of the bows of a pair of nail scissors; I perceived, instead of the usual patch or circular object, a *curved narrow streak.* And, upon pressing with the bow *all round* the eye, with a sort of gyration in the pressure; I saw the narrow streak *continued all round, having the elliptical figure of the bow.* In like manner, on pressing upon the outer angle of the eye with a blunt-edged *straight* instrument; and observing to press *gently,* so as not to make a deep flexure, which would have produced a *circular* object; I saw a *straight* narrow streak, corresponding in its length with the length of the pressing edge. Other trifling variations in the results might be mentioned here: but the statement of them would be wholly superfluous.

From the experiments and results now described, although they are coarse and clumsy in an extreme degree; and I have not cared about taking any means to modify the fact in any more delicate way; it is placed beyond the reach of doubt, that, if we could occasion as delicate and defined impressions on the retina by external pressures on the eye, as are occasioned by light entering the eye through the pupil, we should then be enabled, *with our eyes shut*, to see a picture of the External World, or any part thereof; and might read books, from types stamped upon the closed eye; as well as we now do with our eyes open.

*Fourthly.*—In confirmation of this specific identicalness of the two causes of Vision—namely—*Light* and *Pressure*; —If we press upon the *open* eye, (which will afford even *more vivid* objects than when the eye is closed,) it invariably follows that the seen Feather is *coincident with*,—(that is, it *appears upon the same spot with*—) whatever *external* object reflects rays of light, through the pupil, upon *that part of the retina, within*, that is affected by the *pressure from without*; thus proving that the *nominally-two* physical agents of vision *are in reality one and the same*.

But I repeat, this particularity of evidence, of the identicalness of the causes, appears to be altogether curious, rather than necessary; since the fact of the *correspondencies* of magnitude, vividness, local arrangement, and *general* shape, of PRESSURES with the OBJECTS which they occasion, must have been all-sufficient for the purpose.

In order to prevent misapprehension, I may here point out that it is *not the same* impression, in these experiments, that occasions a sensation of *Touch* and a sensation of *Color*: on the contrary, we have seen all along, that the pressure which occasions the sensation of Touch is on the *opposite side* of the eye, and of the Sentient, to that on which the Color appears. The reason of this is, that the pressure is made *immediately* on the eye-lid, and mediately on the sclerotic coat; both which having nothing to do with producing vision, the impression they convey is *not crossed over in its way to the Sentient*: whereas, the impression made, *still more mediately* through these two coverings, upon the *retina*, IS *crossed* over in its way towards the

Sentient; and, hence, the Touch and the Color are felt on opposite sides in the Sentient. Moreover, if the *mediate* impression upon the *retina* were not too delicate to occasion a sensation of Touch, along with that of Color, we should in the above case have *two sensations of Touch*, a stronger and a weaker—one of them being on each side in the Sentient. In proof of this, we find that any violent light, or other such cause, affects the mind, *through the retina*, painfully as a sensation of *Touch*.

The fact that, when the *same individual act* of pressure affects, *respectively*, *the unvisual coverings* of the eye and the *visual lining called the retina*, the impression on the former is NOT *crossed over*, and that on the latter IS *crossed*, affords, of itself alone, a remarkable confirmation, (if any such had been wanted,) of the *adapted mechanism* for the recrossing of visual impressions behind the eyes.

The stumbling-block constituted by the Berkeleian Hypothesis, concerning a generical difference between our various Modes of Sensation, having been subjected to the above tests; I trust we may now proceed, with an interest proportioned to its removal. This Proposition, however, may, by some readers, be read with better effect after the perusal of the Fourth, when they will have gone through the details of experiments.

## PROPOSITION II.

*There is* NO INDUCTION *of facts, except those of the Phenomena of our Mind: And the overlooking of this partition has been a great cause of error in Philosophy. The restitution of this distinction is indispensable to the existence of Pneumatology.*

The mischiefs of a false phraseology, in misleading the understanding, are a well-known opprobrium in Philosophy. And, while two of the causes of this evil—namely—our biases and our ignorances—are also known; there is a third, which is very little noticed, it consisting in the employment of *figments*, the use of which has no other apology than a desire of convenience in the saving of circumlocution; and a saving, likewise, of some incumbrance of thinking, which would subject us to carry two collateral trains of objects in our mind at the same time,—a burden altogether necessary to be carried in the investigations of Pneumatology, but which may be thrown aside in those of Physical Experiments.

The name of INDUCTION has been given to the evidence we have for all the facts in the circle of physical sciences. And the word—" INDUCTION"—is regarded as a device painted on the banner to which the Experimental Philosopher triumphantly points, as the ensign of his conquests over our ignorance of the laws of nature. The Reideian Philosopher, smitten by the sight of those conquests, contrasted with disasters in his own Science, enjoins his followers to an exclusive cultivation of the Inductive Method: While he laments, and continually urges, the evil of our being *immersed in the perception of the qualities of a substance foreign both in locality and essence* to those of Mind; and ANOTHER EVIL, STILL GREATER,—namely —that of our imagining to ourselves ANALOGIES *of those external qualities, and imputing these analogies to the phenomena of our Mind.* How, then, will a reader be surprised,—(and the less he is in the subject the more he will be surprised,)—to be told that nearly the whole of this view is *a mass of most certain illusion,*—that the *very reverse* of it is the truth,—and that there is not a more indisputable position than that this illusion must be expelled from the subject, before we can attain a logic fitted to the advance of pneumatological science. A brief account of the origin of the Phraseology in question may greatly tend to facilitate its removal.

It is evident from the quotation of Sir Isaac Newton's query, given in the title-page of this Supplement, that the most illustrious followers of the so-called Inductive Method, inasmuch as they confidently believed in the existence of a *Sensorium,* and in our *perceiving through the medium of Species,* could never have believed that we have an INDUCTIVE knowledge of *any external* fact. They nevertheless applied the name of induction to their ANALOGICAL INFERENCES of external facts, because they had a *real induction of the Sensations on which those inferences were bottomed,* and this phraseology saved any expression, and any *thinking,* of our mental operations in the conduct of the physical processes. In so doing, Newton and his associates never thought that any mischief could arise from the use of the misnomer; insomuch that, although he expressly explains in his Optics, that we *never perceive light,* but perceive *only our own Sensations of Color,* he nevertheless exclaims, upon his opponents, that he *does not feign hypotheses;*—an assertion which, in strictness, he must have known was not true; but which was *true in construction,* because all he meant (and he knew he was well understood) was, that he did *not frame hypotheses out of his* IMAGINATION, but advanced those only which, as I have said, were *bottomed upon his* ACTUAL SENSATIONS.

If this account of Induction, and of Newton's estimate of it, cannot be contraverted; then, What becomes of the pretence that we are immersed in a perception of the qualities of *external* things; and frame to ourselves *analogies of those external* qualities, in order to describe and liken *our own modifications?*

But the mischief which Newton never anticipated has come to pass. In other words, it has, since his time, been started, and erected into a great scheme of philosophy, that we argue FROM external qualities, (of which it is certain we never have any induction;) and TO our own modifications, of which alone we have an induction. And the aim, in thus reversing the most certain of any facts *in the order* and *superiority* of our knowledge, is to assume that *mental* qualities have *nothing in common with external* qualities, i. e. that the *Percipient Subject* has no quality in common with the *External Subject which is admitted to be the physical cause* of the perception.

It is evident, on this statement, that the admitting of the misnomer ("INDUCTION") to express the ANALOGICAL INFERENCES of the mind, has operated most mischievously, in holding up to all Natural Philosophers, as well as to ordinary readers, *that the facts of which we have an induction are the facts of the external world:* which is precisely the doctrine of the innovating philosophy; the upshot of whose assumption is that we *perceive the things of the external world themselves immediately*, in the same sense as the vulgar think we do. And, although a large proportion of Natural Philosophers are not drawn into this deception; they turn with indifference from such confusion, and confine their interest to their own department: While all general, or mere literary readers, are led to imbibe the fallacy in question, from its accordance with the *admitted phraseology concerning induction.*

Had Newton been living at the time, however, he could not have prevented either the advent or the diffusion of the Reideian Philosophy. He had no evidence of Phenomena, that could withstand the seductions of a sublime chimera with regard to the nature of our sensations. And all that he could have done was to turn, as his brethren now do, in despair from the subject; thus increasing the evil, by leaving it a derelict in philosophy, and a mere *springe* for the snaring of superficial readers. In other words; it would have been unavailing in the whole Newtonian phalanx to insist, *from deduction*, that Vision, or Perception, *must be* of things in the Mind; so long as they had discovered *no means of demonstrating*, INDUCTIVELY, *that the things perceived* ACTUALLY ARE *there.*

This brings us to the *application* of the foregoing statement, to its bearing upon the *competency* of our Sensations of Color, especially those occasioned by Pressure, to serve as evidences for determining the Figure of the Sentient Subject. In the first place therefore, I observe, No competent advocate of the Reideian Philosophy will ever place himself in the situation of affirming that the Figured Phenomena called Peacock's Feathers are *external* things. Neither will he affirm that we SEE THE PRESSURES *which occasion* them. But, if this be above all controversy; it must hold equally, that, not only these Figured Phenomena *themselves, but also their local bearings,*—their *distances between each other,*—and *all their local mutations, and phases,—must be in the Sentient, where the Phenomena themselves are.* It follows, without a question, that whatever is determined concerning the Figure of the Sentient by the phenomena and mutations of Peacock's Feathers, is determined INDUCTIVELY *in the only true import of that term,* and stands *above* every other class of proofs, of any fact whatever.

As a special example of this; I now observe that, all the *facts of Optics and Astronomy*, being *no higher than* INFERENTIAL, *are not only inferior in their evidence* in support of these facts; but, along with this, THEY HANG FOR THEIR SUPPORT UPON *precisely the same* evidence, specifically taken, as that of the Peacock's Feathers. Thus, when an Astronomer affirms the fact of *the place,—the bearing,—the contact,—or the motions,*—of any one, or more, of the heavenly bodies; his sole evidence, in support of this assertion, is *the place,—the bearing,—the contact,*—or *the motions,*—of one, or more *Patches of Sensations of Color;* which masses of Sensation he *calls Jupiter*, or *Saturn*, or their *Satellites*, or some such name of an *External* Body; though, all the while, if he be a true Newtonian, he knows those objects are nothing but modifications of his own mind. Impeach, but for a moment, the certainty of the relative magnitudes,—distances,—contacts, and—mutations,—of the patches of sensation in question; and we annihilate all the facts of astronomy, without leaving a vestige of reason behind to support them. In Optics, the very same annihilation would take place, of the asserted *proportions* of of various colors in a *so-called* "Spectrum of the Sun;"—and in the radiation, the refraction, and reflection of light. In a word; the competency of the Phenomena herein called Peacock's Feathers, for the present purpose, cannot be so much as impinged upon by a doubt, unless we would render all natural science no better than a romance.

The Sensations now in question—may, certainly, in some of their Phases, furnish us only with dubious inferences, upon certain points in determining the Figure of the Sentient; just as Sensations, which we in Astronomical phraseology fallaciously call *Phenomena of the Moon's Surface, or of Saturn's Ring,* may leave something to be desired in our conclusions regarding those external and unperceived bodies. But, *in so far as the former are conclusive,* I repeat, they do not brook a hesitation, or a doubt, that would not involve the whole of Natural Philosophy.

Owing to the accident of Newton's mind having, by some means, been called off from tracing Vision into the Head by the phenomena in question, (an accident most unfortunate for the past fate of Pneumatology,) Dr. Reid was left at liberty to hold up with systematic ridicule the belief that, during vision, Color Objects exist "*in the dark chamber of the brain;*"—a procedure on his part which proves how little he anticipated that his Philosophy could ever be assailed on *this* side;—and a procedure, too, which has been received with such influence and consequences by that proportion of pneumatological readers of the last age who have embraced, as being equally true and sublime, every position that is part, or parcel, of the doctrine of *nonresemblance* and *nonlocality.* What, then, would Dr. Reid now say, were he alive: Or, Would he *still make a stand and* DENY that the so-called Sun and Moon, and all the so-called Bodies of the Solar System, which we ever perceive, *i. e. of whose existence we ever have any* INDUCTIVE knowledge, *are Objects which appear, and revolve, and change their bearings,* IN THE BRAIN,—*I hardly need say,* IN THE MIND *in the brain?*

In fine. A more striking example could not be required, of the confounding, *not only in name, but in effect also,* of INDUCTIVE knowledge with that which is *only analogically* INFERENTIAL; (while none could place the Reideian Scheme of the *inextension of our sensations of colors* in a more chimerical light;) than the fact that, no less a writer than DR. REID *so totally confounded, and identified,* COLOR—*a mental affection,*—with LIGHT—*an external agent,*—that, it is plain from his procedure, he would as readily have anticipated that *two* might be proved to be *six,* as that *Color Objects can exist where Light is not.*

But if the proved existence of Cerebral Vision has rendered the real pretension of the Reideian Philosophy as irresistibly manifest, as I apprehend it now is; What, then, have the Continental Writers left to cling to, in the Reideian Scheme: Or, What becomes of *all the sweeping and supposed-sublime condemnations* of physical analogies concerning the nature of Thought, and of Mind? When the foundation is thus gone; What can longer render the superstructure tenable, in any of its assumptions?—" *And* " *these things being rightly despatched, Does it not appear* " *from the phenomena that there is a Being, incorporeal,* " *living, intelligent, omnipresent, who, in infinite space as* " *it were in his sensory, sees the things themselves, intimately and thoroughly perceives them, of which things* " THE IMAGES ONLY, *carried through the organs of* " *sense into our little sensoriums, are there seen and beheld by that which in us perceives and thinks?*"

The great INDUCTIVE conclusion, which flows legitimately from all that is said above, is this:—MIND *is a* SUBJECT, *of which* FIGURED COLOR OBJECTS *are* AFFECTIONS.—And the great INFERENTIAL conclusion, which flows from this, is that the proposition is CONVERTIBLE, (although I do not take room here to illustrate it,) namely—WHATEVER SUBJECT *supports the affection* called FIGURE, is MIND. According to the Newtonian rule for the assigning of causes, there is not a conclusion in Natural Philosophy that stands higher, in legitimate filiation, than this one. And it is because the Reideian Philosophy, in addition to its amount of fallacy, plays in effect into the hand of Atheism, by upholding the belief in Matter, that I have unceasingly, as far as circumstances would permit, labored, step by step, in evolving the successive stages of proofs of the *Mentality of all Extended Substance*, beginning with my early speculations on the subject, and ending—(as I suppose it will end so far as my labor is concerned)—with the present investigation of the Sensorium, through those figured mental affections which form the immediate objects of scrutiny in this supplement.

It may not be superfluous to observe, for the sake of readers of a certain depth, that this course and result are not to be confounded with the Cosmogony of Bishop Berkeley; from which, they are as foreign on the one hand, as they are congenial with that of Newton on the other.

## PROPOSITION III.

*Phenomena which determine that the Transverse Vertical Figure or Equator of the Sensorium, in Man, is either Circular or Elliptical.*

It was known all along, from Anatomy, that the figure of the cranial eye approaches that of a concave sphere,—a form which enables it to receive impressions of light conveyed through the minute aperture of the pupil, and to diffuse them, *crossed over* upon the retina, in an inverted order from that of the correlated points of the external objects which reflect the rays. And it has been shown, throughout the previous stages of Cerebral Vision, that the retinal impressions, just mentioned, are *afterwards* RECROSSED, somewhere posterior to the eyes; and that, thus we see objects erect, owing to a *rectification* of the inverted retinal impressions, in their way *backward*, before their discharge in some unknown manner upon the perceiving mind.

These considerations, and that of the phenomena which present themselves on our first and most limited attempts to investigate the subject by means of pressure, strongly indicate the probability that there is an analogy, and this a very close one, between the Figure of the cranial eye and that of the Sensorium. And the whole appearance, thus far, goes to shape conjecture for the course of investigation which has been followed.

It is farther to be premised, from the whole tenor of experiments on the subject; (although some deviation in this respect, *as to height*, may exist without affecting the investigation;) that the Sensorial Region appears to be situated *nearly in a horizontal* direction behind the cranial eyes; and, as *mediately between* the two as that posterior situation will admit. Perhaps, for the purpose of illustration, we may suppose the Sensorium to form *nearly an equilateral triangle* with the two eyes, as represented in the Plate;—any greater posterior distance of the Sensorium, which may in reality exist, making no difference to the results.

It is another preliminary point, settled upon the most indubitable induction, that the Sensorial Region is in its *main bulk* COMMON to impressions from both the eyes: Although, it is equally certain that it extends LATERALLY, on each side, in a *wing, or process*, liable *exclusively* to impressions coming from that eye which is on its own side; the nervous mechanism not being able to *reach across laterally*, so far as to impress the extreme of the opposite side.

Taken in its VERTICAL extent, the Sensorium is *wholly and strictly* common to impressions from both eyes.

The objects for consideration, in this Supplement; being those Masses of Sensations of Colors called Peacock's Feathers, or other Phenomena of the same Tribe; it happens, from the same sort of deception by which we refer any of our Sensations of Touch to that part of the body at which the nerves terminate outwards, that, to the Experimenter, the Feathers *appear to be in the* EYE; and, sometimes, as if *thrust out beyond the eye and nose, into the air. In every instance of experiment, therefore, we are to remember to correct this deception* by an act of our judgment; by which, we must *transpose* the Feather to the *Sensorium:* And, in so doing, it is vital to a true apprehension of the subject that we must *always place the phenomenon on the opposite side of the Sensory, (whether it be right, left, front, or back,)* to that *side of the eye* on which the pressure is made.

With this much of description, we may now lay down a diagram of the different lines, and positions, on which it is requisite that pressures should be made; or, at least, on which I have experimented, as described in the following details. And, for the sake of distinctness, I shall here employ the nomination of *two great circles on the eye;*—and likewise of two *great circles, analogously, on the Sensorium:* One of which may be called the *Equator;* it being, in the case of the eye, that *Transverse Vertical* Boundary Line which has the Pupil and the Back of the Eye for its Poles: And the other, which also passes through the Poles of the eye, may be termed the *Horizontal;* it being that which is in the same plane with the external horizon, when we are standing upright and looking round us on the general field of external objects. These, and the two analogous great circles on the Sensorium, will be sufficiently understood from this description and a reference to the PLATE. It is evident that the two circles in question, in each case, being one at right angles with the other, involve the whole gross Solid Figure of the Sensorium in the one case, as it does that of the Eye in the other. Accordingly, a course of pressures upon these great circles on the eye must form our *principal* course of experiments: While a similar procedure on *lesser* circles, or on *arcs* of lesser circles, as well as on a variety of other points, will make our *secondary* course.

It only remains to explain, that the word—*Sensorium* or *Sensory*—is employed here instead of the term *Sentient Subject or Sentient*, when no mistake can arise from this use of terms. The *Sentient* Subject, moreover, is the *Percipient* Subject: But, as it forms a most important consideration in the present inquiry, in confirmation of the results of my former speculations on this subject, that the *Mind estimates objects from a* COMMON CENTRE OF PERCIPIENCE *within itself;* from which *common point, all Companies or Pluralities of Local Relations or Bearings* of Sensations of Colors *are perceived or adjudged;* this consideration renders it requisite that a percipience of a SINGLE *mass, or point, of Sensation of Color*, and a percipience of the *several local bearings of* ANY PLURALITY of sensations of colors, demand a due distinction in the phraseology employed in treating of them. *As there is no fact within the mind that is* MORE *certain; and, no fact in external nature that is* SO certain; as the existence of this Common Centre of Percipience; it must be rigorously held in view, in all our researches on the Subject. I have already pointed out, (in Prop. 2,) that, among other facts, this Principle is the *sole foundation and support of Optical Science and Astronomy.*

These considerations being placed in the reader's view, I proceed to the proposed induction.

### *Experiments and Phenomena.*

1.—If we institute a pressure, with a pin's head, vertically all round the exterior of the globe of the eye, as far back as the parts will conveniently admit; this process will impress a *Transverse Vertical Circle,* about half way between the pupil and the Posterior Pole of the eye, or, in other words, it will delineate that great circle of the eye which I have called its *Equator*.

Here, by the way, we are to note that, none of the circles, or lines, or bearings, or distances,—in short, *none of the phases, including therewith the magnitudes*, either of the *pressures* or of the occasioned *Feathers or Objects*, are spoken of with any thing like *mathematical accuracy;* but only as being *measured by our adjudgment in perception:* While it is certain that, no deviation from accurate truth, in any of these respects, can in the least degree vitiate, or affect, the truth of our conclusions on the subject. As an example of this; I may remark that, for any thing yet known, it may come out in future investigation that the Sensorial region is *not equal, nor near equal*, in *magnitude* to one of the cranial eyes: in which case, the real magnitudes of, and distances between, the Feathers, will not be equal to those which belong to the *retinal impressions on the eyes:* but, still, the magnitudes, and distances, of the Feathers will *not only be real* magnitudes and distances; but they will *also be, to perception,* PROPORTIONAL to those of the retinal impressions; and, *upon this foot alone rests all our assertions of facts* regarding the motions, or places, of the heavenly bodies; and the magnitudes, or proportions, of the colors or parts of a so-called *Spectrum of the Sun.*—When we assert that a Satellite has appeared, or disappeared, from, or behind, a Planet; we have no other evidence of this fact; *and no other or more exact method of measuring* it; than in, and by, our perception of two visual phenomena or objects which may, in the utmost strictness of classification, be termed *two modifications of the Peacock's Feather.*

Now the result of the pressure, above described, will be that we shall see a *Peacock's Feather;* and see it *travel all round,* that is forming, to our perception, a *Circle;* which, in fact, will be a *Transverse Vertical Circle in our Sentient.* This circle will appear as if it were travelled, by the Feather, in and round the field of the EYE; the Feather invariably maintaining a situation *opposite to the point of pressure.* But it has already been explained that, we are to correct the deception which places the field of vision in the eye, by translating the Feather to its real field, back in the Sensorium. And we now know that it is somewhere in the course of the travelling of the *impression*, backward toward the Sensorium, that it *is* RE-CROSSED OVER, and is thus deposited on the *opposite side of the Sensorium*, to that side of the eye that is impressed.

2. If, instead of *one* pressure, or pin's head, we now employ *two*—namely—one upon each side of the same eye; the same sort of result will be seen, that is to say we shall see *two* Feathers, each of them travelling in a circle round the Sensorial Region, and each maintaining its position opposite to that impression on the eye which occasions it.

3. If, in the next place, we press round the eye in any *lesser* circle, parallel to the eye's Equator, and between its Equator and its ***Posterior Pole;*** we shall see a Feather travel in a circle as before; but in a *lesser* circle, it being always in proportion to the size of the circle impressed. In conducting this experiment, we cannot accomplish a *complete* circle much farther back than the Equator of the eye: but we can effect this in *detached curves* to a very considerable approach toward the Pole, insomuch as to leave not a doubt that a pressure upon its Pole would occasion our seeing the Feather as if it were in the Pupil, that is as if it were an *external* object directly in front of the eye.

From involved considerations, which fall not within the scope of this proposition, I shall postpone an account of correspondent pressures on lesser circles *anterior* to the eye's Equator. But, without any consideration of these, it is conclusively manifest, from the induced phenomena with a single eye, that the ***Anterior Half*** of the Sensorial Region nearly resembles that of the Cranial Eye in its Figure—namely—that of being nearly ***Hemispherical***, unless we could be warranted to conclude, which seems at first sight extremely improbable, and which will be shown to be contradicted by proof, that the Sentient subject is *merely a flat surface, without depth.*

4. Having put the subject to the test by pressure on a *single* eye; we may next proceed to that of a still higher criterion, by calling *both* eyes into action. With this intent, if we press simultaneously upon the outer angle of each eye; and carry the pressures round the eyes, nearly on their Equators; we shall see *two* Peacock's Feathers, each travelling in a circle, and maintaining its situation in exact opposition to the point of its own pressure. And here, the most remarkable new phenomenon for our consideration is that, instead of the two feathers travelling *throughout in one same* circle, or orbit, as happens when we press on two opposite sides of the Equator of a *single* eye, each of the Feathers, in a great part of its course, exhibits *an exclusive orbit of its own,* but which *intersects,* though it does not throughout coincide with, that of the other. The place to enlarge upon this last consideration is farther on. In this place, it is enough to say that the phenomena, taken together, put us in possession of the fact that the Sensorial Region is, *in gross,* common to impressions from both eyes; but, that it is *extended laterally, on each side,* to a field which cannot be reached by impressions from the farther eye, as shown in the Plate.—It follows, from this experiment, that the Sensorial Region, as far as it is revealed in these results, is not strictly of the figure of the eye, or *spherical;* but is *extended laterally, very considerably more* than it is *vertically,* and so far appears to be of a *spheroidal* figure.

The disposition of the two eyes which reveals this figure is evidently contrived, or at least is such in fact, as serves for the useful end of *enlarging the horizontal* field of our vision; which, I shall hereafter shew, is far greater than is at all supposed by Optical Writers: While its utility for our information, and preservation, is evidently great; though it does not strike our ordinary notice.

## PROPOSITION IV.

*Phenomena which determine that the Horizontal Figure of the Sensorium is either Circular or Elliptical:—Which result, taken together with that of the Third Proposition, makes the Solid Figure of the Sensorial Region either spherical or spheroidal.*

It is certain we could not tell, from an act of mere Vision, or Perception, whether the circular motions of the Peacock's Feathers take place upon a *convex, or a plane.* And, however improbable it might seem that the Sentient Subject should be a *Plane, without Depth;* the impossibility of determining the fact, by the course of experiments described in the Third Proposition, places us under the necessity of resorting to other means of solving the question, in order to place us in greater certainty with regard to it than could be derived from analogical conjecture.

If, with this intention, we now commence, and press round a single eye on *any lesser* circle, *anterior and parallel* to the Eye's Equator; we shall see a Feather travelling round, in a circle that *appears larger* than that which is occasioned by pressing upon the Equator itself. And here we are to recollect that, under the law of the *relative local opposition* of color images to their occasioning pressures, all pressures made on any points *anterior* to the eye's Equator occasion color images in the *Sentient* POSTERIOR *to its Equator.* As, therefore, the Feather, which appears in the present experiment, exists and travels in a vertical circle in the Sensorial Region *farther back* than its Equator; if this Region be supposed to be spherical on its posterior side, it might at first sight appear, to any one who has never considered the subject, contradictory that a circle upon it, which certainly *must in* *reality be less* than its Equator, should be *seen as being greater*. But, upon a moment's reflection, it must be self-evident that this is the very appearance which any such lesser circle must present, to a *Common Centre of Percipience situated in the Interior of a Spherical Sentient*. We are, consequently, here called upon to recognise and contemplate this Sentient Centre of Percipience.

*And First*. It is a self-evident fact in Optics, that the *Eye* is the Common Centre of what is *called* the percipience of *External Objects*; it being from the eye, considered as a common point, that we judge the *separate direction* of every one of the external objects which occupy our field of vision, at any time; and from which, also, we measure their *angular distances*, and hence *estimate, or guess, the real* distance of these objects from one another. But, by the detection of Recrossed Vision in the Brain, it is reduced to actual proof, (what indeed was always in general *believed*,) that the *Region of Percipience is no more in the* EYE, than the *act itself* of percipience is in the eye, or than the *Color Images perceived* are in that organ. It follows, that the Optical Principle which assumes that the *Eye and External Objects* are its Subject and Objects; and which does so with a sufficient truth of analogy for the purposes of that Science; must here be known for a profound illusion, imposed upon Visive Beings by a most beautiful and beneficial contrivance. And we are, forthwith, to *translate* this illusory and unreal Centre of Percipience, as well as the objects perceived; and are to recognise the real ones as existing in the Sentient, wherein alone they reside. This existence of a Centre of Percipience is a fact placed above all question. And its adaption to the solution of the problem in hand has been manifest throughout.

*Secondly*. Our next consideration, although it is a fact in the mind, bears reference to an *external* fact; which last, I think, has not been adverted to by Optical Writers, but which bears with considerable importance upon the present subject. By those Optical writers who mention the matter at all, I think, it is not supposed that our *Horizontal* line, or arc, of vision, when we look around us with both eyes, is greater than a *Semicircle*. But it is a fact, which I have ascertained by a great number of trials, that the line, or curve, in question is not less than 240 degrees. Thus, when we look with both eyes directed straight forward, we can see, with each eye at the same time, the flame of a candle, or other objects less luminous, whose direction is *at least thirty degrees behind the eye's Equator*. Here, then, is a lateral field *seemingly* on each side of the EYE, but *in reality on each side of the* SENSORIUM; any thing near the extent of which, so far as I am aware, has never been recognised, or suspected, but the existence of which will explain to us the appearances which we are now trying to account for.

*Thirdly*. While we are called upon to recognise the *benefit* of our being able to see objects, however vaguely, in directions posterior to the Eye's Equators, since this capacity manifestly serves to give us warning of many objects, the proximity, or existence, of which might affect us, and which we could not otherwise be aware of; it is certain we do *not see distinctly*, and consequently do not *particularly attend to*, objects the light from which, through the pupil of the eye, falls upon the retina *anterior* to its Equator. At the same time, we are to remember that all the impressions on the Retina, anterior to its Equator, occasion Images that are *posterior to the Equator of the Sentient*. Now, any pressure on the eye anterior to the Equator, that approaches the pupil *as nearly as the edge of the cornea*, will not occasion a Feather or image at all. And the consequence of this is that, we cannot occasion an image *far enough back* in the Sentient; or, at least, we cannot make such an image *travel sufficiently round in a circle, or curve*, to determine the problem from an *instant inspection* of a circle small enough to afford us a conviction of its relative size. The cause of failure, in this case, seems to be the *lessening sensibility of the retina,* which diminishes gradually as we advance from the Equator towards the Cornea. And, although we can occasion a *single* Feather as far back as thirty degrees, or considerably more, behind the Equator of the Sentient; we not only cannot make this feather *travel round in that latitude;* but, we can hardly occasion *two* Feathers at the same time, one on each side, by two opposite pressures on the eye, the ready effecting of which last might, I think, settle the question, as will appear from what follows.

In pressing upon the anterior hemisphere of the eye, however, there is another cause of impediment, besides the lessening Sensibility of the retina: And this cause seems to be the *limited* sensibility of the *whole* retina. The fact, as was before observed, is that it is not for want of *room* on the whole retina, that we cannot occasion more Feathers at a time; but it seems to be that, when the sensibility of that nervous expanse is occupied by three, or four Feathers, (at whatever distances from each other,) the unoccupied parts of the retina are incapable of conveying more impressions to the Sentient—which fact, at the same time, is rather unaccountable, since we can not only readily occasion *two* Feathers *very near* each other, but we can actually throw the one upon the other, partially, or wholly, at our pleasure. The fact, nevertheless, is certain; and it operates so much more in the case of pressures on the *anterior of the eye,* that, as I have above observed, we can *hardly occasion two feathers, at once,* much behind the Equator of the Sentient. At least it has so happened in my case.

The experiments, here first to be described, are given in the order in which I had employed them,—an order which, it is to be observed, is the most unfavourable for determining the question; but which I adopted as appearing to be the most natural to begin with. I suppose, not only that the issue is as conclusive, as could have arisen from the places and directions of the pressures, when affecting a Spherical Sentient endowed with a Centre of Percipience; but, also, that the nature both of the Eye and of the Sentient, and that of the Correspondence between the two, are considerably illustrated, in the estimation of the competent reader, by the variety of particulars involved, which, indeed, are much more numerous than I have deemed requisite to describe.

If, thus instructed, we begin to press on the LEFT side of the *right* eye, *as far back as possible*, which will be very considerably behind the Equator *of the eye;* and carry this pressure forward, on the line of the Eye's *Horizontal Great Circle;* we shall, first, see a Feather, perhaps, twenty, or thirty, degrees apparently on the RIGHT of the eye's anterior pole; and, as the pressure travels forward, the Feather will *travel to the* RIGHT, *thus increasingly revealing the lateral extent of the Sentient to the right*, until the pressure has attained the *Equator* of the Eye. This result moreover, confirms what took place in the case of the Third Proposition, wherein we pressed in *lesser Vertical Circles parallel to the Eye's Equator;* from which process, we determine the circularity, more or less, of the *Equator of the Sentient.*

But if, in the present case, with a view to determine the posterior shape of the *Sentient*, we resume our pressure, and make it travel *still on the horizontal line of the eye forward from the Equator;* we shall then have *new phases* of the Feather, which will demand our most critical attention. The Feather, in this case, will *still increase its apparent travel to the right:* And therefore, to a first or superficial observer, it would seem that the *Sentient is now revealed in a greater lateral extent to the right*, than it was when we pressed upon the eye's *Equator*. But this last result contradicts the correspondence, or analogy, of the *anterior shape of the eye;* by which, we found that a smaller circle of pressures upon the eye occasioned a smaller circle of Feathers on the Sentient. And this contradiction, alone, is ground for strong suspicion, that the present apparent increase of the Sentient in a lateral direction may be truly accounted for in another way. Accordingly, after trying very repeatedly, on each side of the eye, an acute observer will, I think, be persuaded that the Feather, though it *appears to travel laterally*, does in *reality travel backward, and not laterally:* While it is certain, as was already observed, that the *appearance of lateral* travelling is that *very appearance which the Feather must have*, from a *Common Centre of Percipience* in the interior of the Sentient.

There is a *peculiar*, though a *very slight* and *perhaps an inconsiderable*, *dimness* in the aspect of the Feather in this stage of its travelling; which, of itself, must lead any acute observer to suspect that it is not the result of a *real lateral* progress. After innumerable trials, I have found that the phenomenon cannot divest itself of this suspicious appearance: Which, when taken into consideration with the analogy of the sphericity of the whole eye, must, I think, be admitted to form a strong evidence in the matter.

It is proper to add that, more than once, by pressing *far forwards*, on opposite sides of the eye, I obtained a glimpse of two Feathers so *far back in the Sentient*, and so nearly at the same time, as to strengthen my belief in the fact here inferred; although I cannot say that the result was sufficient for a full conviction drawn from the experiment itself. In this case, a younger eye might perhaps have succeeded better. It is also proper to remark that a Feather, as it travels in the way last described, does not invariably become *so much more faint* as might be expected, that is to say provided it had been vivid at first: but it *always alters its phase chiefly by a* LESSENING OF ITS DISK, ON ITS OUTER OR POSTERIOR *side;* so that, at last, *only half* of it, *or less*, is visible, with its *bow presented forwards*, and, as it should seem, its back part lost, *or rather not formed*, owing to a want of sensibility in the retina near the cornea. Now, the disappearance of the posterior part, before that of the anterior, certainly corresponds, as it ought, with the *anterior point of the pressure's* being *upon an insensible part of the retina.*

In order to illustrate, by experiment, what has been advanced in the two, or three last paragraphs, as arguments for the Sphericity of the Sentient; If we place a hoop in a horizontal position round our head; and suspend, by a looped ribbon, a round patch of colored paper, on a level with the eye, and three or four inches in diameter, to represent a Peacock's Feather; and, then, make the Feather *travel round, backward,* upon the hoop, *until we lose sight of it;* this will afford us an exact representation of the *partial,* and *total,* manner in which we lose sight of a Feather occasioned by pressure, *without its suffering any great* diminution of lustre. Now, the circularity of the hoop in the one case, affords an evidence of the circularity of the *Posterior region of the Sentient* in the other.

If we could carry the investigation no farther, than the experiments and issue already described; I apprehend, no person could reasonably doubt of the Sphericity of the Sentient, as indicated by what has appeared. But, still, it may be said that, we lack an *experimentum crucis,* in order to afford complete satisfaction on the subject. Fortunately, therefore, for the subject, the thing desired is attainable; as will appear from our proceeding to another, and a final, modification of the course of pressures.

Quitting, then, all pressures upon *Horizontal* Circles, or lines, of the eye; as well as all those upon *Transverse Vertical* Circles; we are now to try experiments on *Fore-and-aft or Meridional* Vertical Circles, or Arcs. And, *first;* If we press above the pupil, nearly on the *Fore-and-aft Vertical Circle or Meridional Arc* of the eye, *as far back as possible;* and make this pressure *travel forward toward the pupil,* until it reach *near the edge of the cornea;* the consequence of this will be, (as in the case of *all great* circles of pressure upon the eye,) that we shall see a Feather travel *apparently in a straight* line; which straight course of the Feather will be *from under and near* *the edge of the cornea, backward,* until we lose sight of it from the cause already explained. This first experiment, therefore, will prove nothing: Nor is it *meant* to prove any thing besides the *consistency in the result of all pressures* on *great* circles of the eye, which must invariably be that of a *straight course* of the seen Feather. As, for example, when we press round the *Equator* of the eye; the occasioned Feather *appears to move up, or down, or across, in a* STRAIGHT line, for a considerable space of its course; Or, in other words, we *do not* SEE *its course curved; but, on the contrary, we* SEE *it travel as if it moved along a hoop to which the* EQUATOR OF THE EYE IS CONCENTRIC: Whereas, when we press upon ANY LESSER circle, we SEE the course of the Feather *curved, continually every instant.* The marking of this distinction will prepare us for the experiment that is to follow.

*Finally.*—If, now, we press in a LESSER *Fore-and-aft Vertical Circle;* (the best, or first, choice of which may perhaps be about half-way between the pupil and either the inner, or the outer extreme of the globe of the eye; and which lesser circle, therefore, will cut off about a quarter of the diameter of the globe, that is will cut off a segment of *about a quarter of the eye, from front to back,* as represented in the Plate by each of the circles—G. H.—E. F. one on each side of the pupil of the eye;)—the result of this last experiment will be that, we shall plainly discern a Feather travelling in a *Fore-and-aft vertical* CIRCULAR *course,* ALL ROUND *the contrary side of the Sentient,* as represented by each of the circles—H. G.—F. E.—We may repeat, *and also modify,* this experiment, on *different magnitudes, and positions,* of lesser vertical fore-and-aft circles, or arcs: And, in each variety of the experiment, we shall continually have the most perfect satisfaction, in discovering the *correspondent circular course of the Feather* ALL ROUND.

The result last described, in every one of its modifications, is at once a conclusive proof of the *convexity of both* *the Posterior and the Anterior portions of the Sentient Subject,*—a proof which does not appear to leave the smallest opening for dissent with regard to the Figure of the Sensorial Region, all the way from its Anterior Pole to within (perhaps thirty or forty degrees, on each side) of its Posterior Pole; concerning which last-mentioned Region, alone, we are still in the dark, *in so far as is revealed by* VISION.

## *Of the Sensorial Aberrations of the Eyes.*

An impediment of very repeated recurrence,—that of my inability to afford such continuance of application as would be requisite for farther advancement,—has obliged me to stop here and submit what has been done, as a Second Appendix to the Rationale of Cerebral Vision,—a step which I adopt in order to prevent the chance of its being misprinted in case its publication should be left to another hand. In this notice, of course, I design to convey my acknowledgment, that, while I trust the determination of the Figure of the Sentient is herein effected in *gross,* there still remain various particulars to be perfected, by some more able and more fortunate hand. The principal purpose, therefore, of the following observations, is to hint (for I cannot attempt to treat adequately) some of the particulars now alluded to, in order that a competent future inquirer may avail of it, in throwing light upon those dark points.

FIRST. The most considerable of these remaining difficulties, is the *want of a total* coincidence, (*laterally taken,*) of the impressions from both the cranial eyes, in their respective discharges upon the Sentient: Or, in other words, the difficulty consists in the fact that, the Sensorial Field, *taken in its lateral extent, is not wholly common to impressions from both eyes,*—not even when the eyes, and the pressures, are so disposed as to produce the *greatest practicable approximation* to a total coincidence.

The fact of the case—(that is the *greatest approximation which we can effect*)—is this: If we press, *as far back as possible*, on the *horizontal* line, on the *outer angle of the left* eye; and, at the same time, press *as far forward as possible* on the horizontal line, on the *inner angle of the* RIGHT *eye;* the Feather occasioned by the *left* eye will be *thrown partially* (that is *about half* of it) upon the Feather occasioned by the *right* eye.—This partial coincidence, however, is unsatisfactory in two particulars: —It is *not total:*—And it is occasioned by pressures upon *uncorresponding points* of the two eyes, owing to *one* pressure's being *anterior* to the Equator of one eye, and the *other posterior* to the Equator of the other. Now this result gives rise to two difficulties—namely—*First,*—It contradicts a hitherto unquestioned principle in Optics, that *impressions on corresponding portions* of the two retinæ occasion accurately—single vision with both eyes. And,—*Secondly,*—It would appear that, in the case of pressure on the *horizontal* line of the eye, *near the Equator on its posterior side*, or on *any point anterior* to the Equator, the occasioned Feather, seen on the opposite side in the Sensorium, must *enter into the Wing or Volume of the Sentient, and must pass through it,* in a way somewhat analogous to that in which a *film* passes through a volume of water.

The curious fact, here last adverted to, I shall leave, as I have found it; with this only remark, that, if it prove to be in reality as it appears, it seems at least to receive countenance from the Anatomical Structure of that Medullary Mass, near the centre of the brain, which, in all probability, is the ultimate nervous instrument of vision. Thus, if we suppose the spherical mass, involved in and making up the *Annular Protuberance,* to be the ultimate instrument of vision; which, in other words, is supposing that the *Sensorium occupies and nearly fills this mass;* in this case, it is plain, the mass in question *must be pervaded by the Sentient;* in some such way as *space pervades* *a body which occupies it.* Nor are we, at all, to suppose that this sort of occupancy could *prevent our mental operations,* any more than we find the agency of magnetism, or of gravitation, is prevented by an intervening body.

In this place, however, it is proper to explain, that SENSATIONS, *being neither films, nor substances of any kind, but affections or modifications* of a Substance, NEVER MOVE IN REALITY IN THAT SUBSTANCE, although they *appear* to move. They move, only, in the same unreal sense that a flame, lighted at one end of a straw, moves and runs along the straw; the real fact of which is, that the *same* flame does not travel along any part of the straw; but, what we see is a *new flame,* called into existence every instant, at every successive part that is consumed of the straw. At the same time, this fact does not in the least affect the validity of our conclusions deduced from the *apparent motions* and mutations of Peacock's Feathers; because, *all their respective bearings, and distances, at any one moment, are* REAL FACTS; and this not the less so, though it may perhaps be found that, the *apparent* distances are *not the true* distances, but are *only proportional.* And, as little does it make against the supposition of the Feather's being, *sometimes, within the volume* of the Sentient.

It remains, then, to consider the *non-corresponding of the Visual impressions,* from the two eyes, as above adverted to. And, first, I may venture to believe that, not one person in a hundred actually sees the *same minute object with both eyes,* unless his eyes be guided by *eye-tubes.* And, *not one person in a thousand* KNOWS whether he sees with *two* eyes, or with *one only.* And, even, when the two eyes are *constrained* to a proper direction, by two eye-tubes; it is *only now-and-then* that we can *catch a glimpse at all of any minute* object *or minimum visible,* with both eyes: At least, such is the fact in my own case; but I acknowledge that one of my eyes is not only dimsighted, but, in addition to this, the axis of the weak eye is experimentally out of the due direction, although the eye does not proclaim this in its external appearance.—Here therefore, I think, we are called upon to *examine rigorously the usual opinion* that impressions on the axes of both eyes produce *accurately*-single vision.

In the outset of this last-mentioned consideration; there can be no question but, when an impression from each eye *falls coincidently upon the Sentient,* they produce *accurately*-single vision. But the question, which we are concerned in, still remains—namely—DO impressions from the AXES of both eyes, or, *from any two points at equal distances, laterally, from the two* AXES, *fall* COINCIDENTLY ON THE SENTIENT: Or, is it not rather a fact that they fall with *some small aberration;*—which aberration *increases,* as the distance of the retinal impressions from the AXES *of the eyes increase,*—a result arising from the *deviation of the direction of the axis of each eye,* from the direction of the axis of the Sentient, the axis of the *right eye* deviating to the *left,* and that of the *left eye* to the *right,* as will be evident from an inspection of the Plate?

But, even if we suppose this last suggestion to be the truth; it still remains to be explained, by what nervous mechanism a pressure on the outer angle of one (*say the left*) *eye* throws the Feather seen on the opposite side of the Sentient *less far over on the right,* than the Feather occasioned by pressing on the inner angle of the *right* eye: in consequence of which aberration, it seems to follow that the Feather, in the former case, is *not an affection of the* SURFACE MERELY, *but enters into the* VERY MASS of the Sentient. That this happens owing to the *disposition of the eyes;* and, that the disposition, and the situation, of the eyes might lead us to *expect* this result; and, lastly, that the aberration in question, *especially in its operation on each side of the head,* is a fact *very beneficial to the animal to which the eyes belong;* are manifest truths: But the *manner in which it is done remains a desideratum.*

—I may, however, remark that, the fact of Sensations of color's entering the mass or volume of the Sentient appears to agree with the analogy of our other sensations; since, doubtless, they all enter the interior of the mind.

What is left for me now to add on the subject, is only what regards the assumed Optical Principle of *Single Vision from Two Eyes;* which seems to open a different view of that Principle.

The fact, then, I conceive is that the reputed Optical Principle in question holds true *only in a vague sense:* by which I mean that, when we have single vision from both eyes, if the retinal impressions upon one of the eyes be *accurately upon its Axis or Pole,* that upon the other eye will be *very near its Pole, but will not be accurately or quite* at the Pole.—And here I observe that, if this extent of aberration in reality exists; I am not aware by what experiment, of looking with both eyes, it can be made to manifest itself.* And if there be no way of effecting this by any judgment we can form from any degree of inclination of the eyes, or by employing two eye-tubes; I then presume, it must be granted, upon the fact of the Sensorial Aberrations of the Peacock's Feathers, that we have herein discovered a fact in Optics, which, though it at first appears to involve no consequence, may hereafter prove to be a link of connexion with, and a finger-post to point out, future advances on the subject. With a view to any such consequence, therefore, I here repeat, it seems plain that, if there be *any aberration at all at the* ressures and Feathers,

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* Having, in innumerable instances, contemplated two contrasted colors, one with each eye, thrown upon the *same part* of the Sentient; I have found it hardly possible to make them *blend perfectly into one* color. In most cases, the two colors *alternate,* being seen *only one at a time.* And, when one is *much brighter* than the other; the former prevails exclusively. But we may often see both *at once, each maintaining its own proper tint.* Now it is certain that so long as this last fact takes place, the nervous impressions from the two eyes *do not fall accurately upon the same elementary points* of the Sentient; although the two patches of color occupy, *in gross,* the same field of the Sentient.

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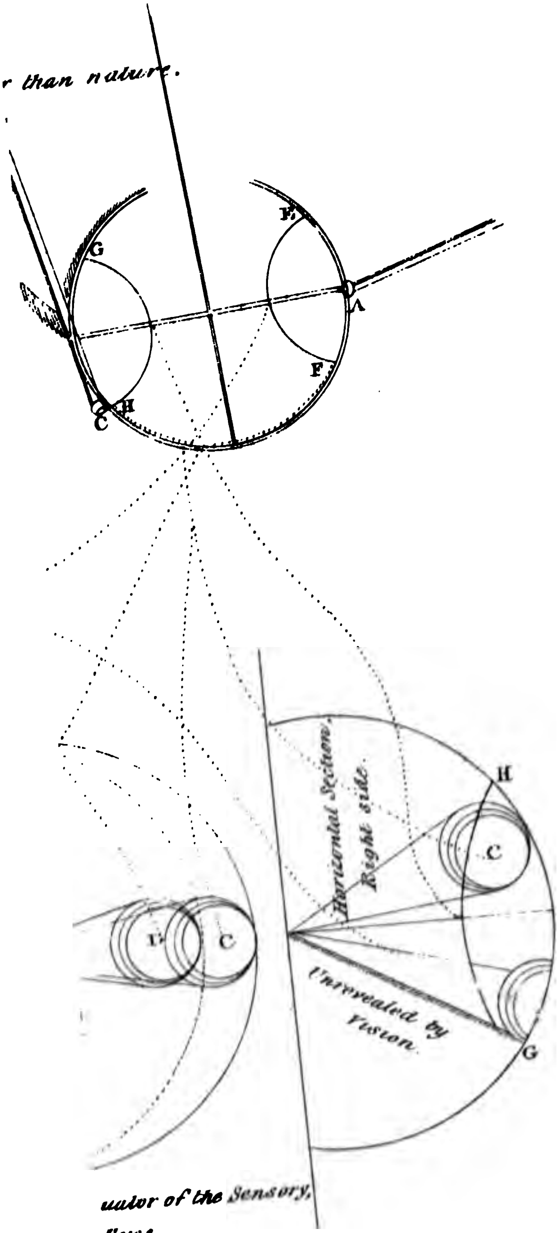

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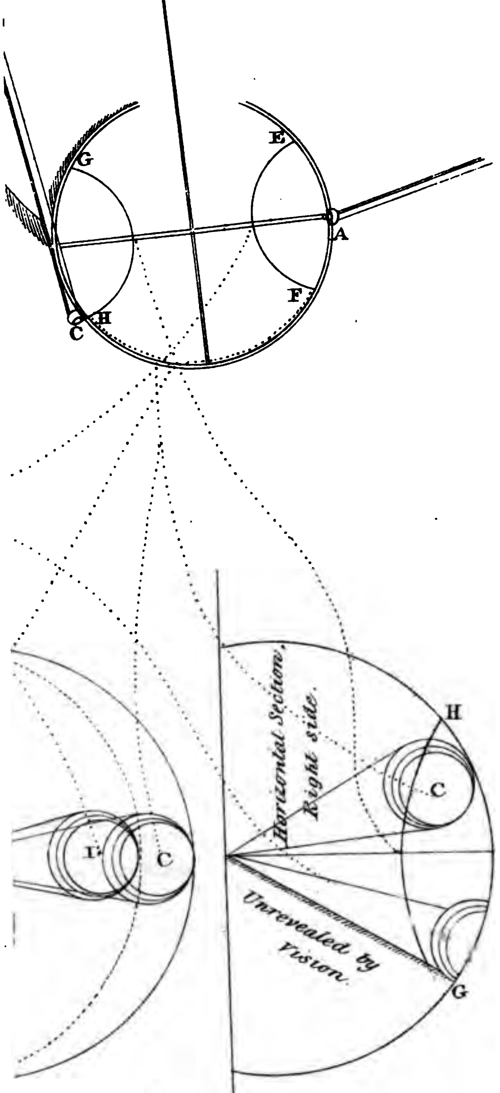
centre; this aberration *must increase from the centre toward the surface* of the Sentient.

Along with this; it is certain that Vision from Pressure has put us in possession of the fact, (which otherwise we never could have known, *even upon* a *general supposition of the existence of a Sensorium*, as entertained by Sir Isaac Newton, Dr. Porterfield, and other Philosophers,) that the Sensorium is larger in its lateral extent than it is in its vertical: and has, at the same time, possessed us of the MEASURE *or* PROPORTION of this Difference.—And the investigation of this fact has led to the detection of another, which may perhaps have its own use in Optics,—namely—that we can see *External* Objects many degrees (*perhaps not less than forty, or more*) behind the Equator of the eye: While, also, it may here be remarked that, we can see a Peacock's Feather, from an impression upon the eye, I think, *exactly as far back*, as we can see External Objects from light entering through the pupil.

One observation may here be added, with regard to a question not entered into in this Supplement;—namely—that which concerns the SIZE or MAGNITUDE of the Sensorium; which is this:—Although we cannot suppose the magnitude of the Sensorium to be *greater, or with any probability so great*, as the Figure in the Plate, here given for illustration; it MAY *in reality be, to almost any degree*, LESS: Because it follows, from the Principle of a *Common Centre of Percipience*, that all seen objects, *whatever be their real* magnitude, *must appear of the same size if they occupy equal visual angles.* At the same time, it is certain that, a *retinal impression*, received from a whole landscape, is *concentrated into the diameter of the optic trunk.* From these two concurrent facts it follows that, a *Sentient not larger than a pea, or a drop of water*, might serve to show us objects of the same apparent size as those which we actually behold; and, that our existing nervous machinery is capable of serving as the instrument of such a minute Sentient. As for the ulterior question,—namely—

*ressures and Feathers,*

*r than nature.*



*uator of the Sensory,*

*Eyes.*

*F. correspond with the Lesser*

*ne its sphericity.*

*dford Row.*

Whether, or not, the impressions conveyed along the optic trunk, are *afterwards re-expanded*, and thrown upon a *larger Sentient* than that last above mentioned? We must, for its solution, perhaps turn our eyes to ANATOMISTS.

## *Conclusion.*

As for what has been done in the present Supplement; the ground which has been gained, has been gained INDUCTIVELY: in other words, from it we KNOW, *in the strict sense of that term,* this revealed portion of our Sentient Subject; and, hence, this knowledge will not brook *any speculative* attempt, *either directly to* DENY it, or, yet, indirectly to set up, or maintain, any scheme concerning the Mind that is *incompatible with* it: Although, I duly concede that the Phenomena, though they are unimpeachable in their Phases as Mental Affections, may perhaps be better, or more truly, explained by those who come after.

In a department so peculiarly obnoxious to impediment from prejudices, and biases, of the most unyielding nature; it may be allowable to reflect with proportionate satisfaction upon the result, that, not even the most prejudiced person can deny that a footing has, to a certain extent, been effected in the desert of human ignorance concerning the Physiological Conditions of the Mind. We cannot doubt, but *Time* will do its farther work upon the Subject. Nor must we forget the CONNEXION which, we are warranted in believing, will be found to exist *between this and other sciences.*

Let those, who have allowably thought there was full reason to despair of fixing any point of the Physiology of Mind, now be awakened, fairly to contemplate the existing prospect; and mark how soon the predictions may be nullified, of those who prescribe the possible limits of our knowledge; and have especially affirmed that the *Problem of the Connexion* of *Body and Mind should never be solved.* Not two years have elapsed since any man, who should have talked of such a thing as Cerebral Vision, would have been heard, by all, with as unqualified derision as if he had pretended to be a dealer in prophecy.

THE END.

PRINTED BY A. J. VALPY, RED LION COURT, FLEET STREET.

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# A LETTER

# TO SIR DAVID BREWSTER.

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TO THE

NOBLEMEN AND GENTLEMEN

CONSTITUTING

THE BRITISH ASSOCIATION

FOR THE

ADVANCEMENT OF SCIENCE.

Gentlemen,

With very great respect, I most earnestly beg leave to lay the following considerations before your honorable body.

The British Association, combining so vast a proportion of the whole scientific light of the Country, is, I need not say, a Court of National Science. But this involves that it is also a Court of National Honor, in all matters that concern Science. At the same time, As your learned Association has but newly risen above the literary horizon, it is certain that the eyes of all Europe will be upon it, perhaps more intently than at any future epoch, to watch the coming pledges of its high honor, and its being pure from all alloy, of favor, or influence; the existence of which has been a lamentable theme of complaint against all older institutions.

It is at a moment so portentous as this, that an old votary to science, who shrinks from no scrutiny of any office of his life, but is peculiarly obnoxious to suffering from being isolated and not connected with any scientific body, appeals to your dignity, and justice.

If it shall appear that such an individual has, by a member of your body, and in your presence, and acting under your confidence, been shorn of the labors of a literary life, by a denial of them in the face of the indubitable fact; which denial, coming from so high and accredited an authority as a distinguished member of your Association, amounts to their certain suppression so long as redress be not had; I humbly submit, with all due respect, that the acquiescence of your honorable body in such an act, after it has been duly laid before you for adjudication, would render that act your own: and the sufferer could have no other tribunal justly to look up to; because, your Court alone can take cognizance of a case of scientific labor, or merit.

It would be a disrespect to the British Association, which I am entirely foreign from entertaining, to fear for a moment that the case now laid before them can fail of finding every justice, according to the facts.

I have the honor to subscribe myself,
Gentlemen,
With profound respect,
Your most obedient servant,
JOHN FEARN.

*Torrington Square, London.*
*October* 1*st*, 1832.

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AS my writings have been, by the most extraordinary circumstances, continually masked from the eye of my countrymen at large; it is of vital moment to the present issue that I should in this place adduce some testimonial, as to who, or what, is the person who has thus appealed to the British Association. The following, therefore, I select from a number which, from involving scientific matter, would occupy much greater room.

### *First.*

PROFESSOR STEWART, in his last letter to me, dated *August* 31, 1820, and which is published in the *Parriana*, after several very flattering expressions, which he attributes to "a penetrating genius" in my first work the Essay on Consciousness, (rude out-laws of the desert as, I own, my earliest writings certainly were,) and to the report of "common friends;"—adds the following conclusion:— "Were we living in the neighbourhood of each other, I "should have much pleasure in cultivating your acquaint- "ance, and I have no doubt that we should find many subjects for our conversation," &c.

Upon this I ask—Would the lofty mind of Professor Stewart have thus uttered the proffer of friendly intercourse, with any man who had announced an attack upon him for *no deeper an offence than "not viewing his speculations with a favorable eye"?*—Or, Would he have held out the hand of intimacy to an obtruder, so obtunded to decorum as to have "*attempted his correspondence?*"

### *Second.*

Professor Stewart having, as the last act of his last book, (his *Moral Philosophy*,) deemed it a proud thing to appeal to both the intellectual and the moral approbation of the upright Dr. Parr; then, in such an exigency as the present, What more fit, or apposite testimonial could I desire, than that of the same venerable person? Accordingly, therefore, I now quote the concluding passage of the remarks which Dr. Parr wrote upon the fly-leaf of the Essay on Immortality: which remarks (it is requisite to explain here) he penned with express reference to the letter which I had written to him when I sent him the copy in question:—

"I love Mr. Fearn, and am glad to record my gratitude to him for turning my attention to subjects which I had before seen dimly and confusedly, and for strengthening my belief in a world to come. My general faith has indeed never wavered; but I am accustomed to weigh carefully, and to welcome gladly every additional argument, by which that faith may be confirmed and invigorated.—*S. Parr, Oct.* 13, 1814."

This concluding passage appears to refer to that preceding remark in which he says—"he was led to a very original view of the moral world, which in my opinion is better understood and better illustrated by him, than by some of our ablest advocates for a future life."—And here it is to be observed, the Essay on Immortality is one of my earliest works, *written more than eighteen years since;* and, as Dr. Parr truly says, owed very little to philosophical reading.

It may well be supposed that I am not insensible, nor yet wanting in pride, at such a testimonial, from such a quarter, on such a subject. But it certainly was not brought in here without urgent need. And when the reader shall have gone through the following Letter, I am content that he compare my impudence with Sir David Brewster's modesty.

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N.B.—With regard to the notable controversy concerning the "*luminous spot;*" I have omitted, in the body of this Letter, to accord my suffrage in favor of Dr. Wells,—namely—that, in my experience, it *does not move;* although I imagine that *some undue* pressure on the eye might cause such a result.

# LETTER TO SIR DAVID BREWSTER

ON his unfounded assignment of Mr. Fearn's moral, in his correspondence with Professor Stewart;—ON his exterminating general implications of the whole of Mr. Fearn's philosophical labors, in every department, the tendency of which cannot be doubtful;—and ON his allegation before the British Association, met at Oxford in June 1832:—ALONG WITH WHICH is given, a Refutation of Sir David Brewster's optical attack on the Treatise of Cerebral Vision: The whole comprising a Third Supplement to that Treatise.

BY JOHN FEARN, ESQ.

LONDON: PUBLISHED BY MESSRS. LONGMAN AND CO.,
PATERNOSTER ROW; AND ROWLAND HUNTER,
ST. PAUL'S CHURCH-YARD.

## *Introductory Matter, containing an enumeration of Three extant Schemes of the Nature of Mind, and including a First Refutation of Sir David Brewster's optical objections to Cerebral Vision.*

THE subjoined copies, of a letter from me to Sir Anthony Carlisle and of his answer, will in some degree introduce such readers, as are only partially acquainted with the subject, to a notion of the extent and diversity of departments in philosophy, which depend for their advancement, and even for their reality, upon the merits of the Optical and Physiological principles which will come in part under discussion in the Letter that follows.

TO SIR ANTHONY CARLISLE, F.R.S., &c. &c.

Torrington Square, September 6th, 1832.

DEAR SIR,

Agreeably with the decision which you have already done me the honor to express, together with the highly important physiological and anatomical commentaries which you at the time communicated, evincing in a degree which my present limits will not admit of adverting to in detail the extent to which the subject had previously occupied your attention, both in the writings of others and in your own researches; I now solicit of you, on public ground, as one of the successive Presidents of the Royal College of Surgeons of Great Britain, the sanction of your recognition that the Treatise of Cerebral Vision, together with its Supplement on Color Images in the Brain, which I previously submitted for your adjudication, has established the ground, that the Perception of Visible Objects is not in the eye, or retina; but that the theatre or locality of that operation is in some cerebral region posterior to the eyes.

When I consider the tissue of facts of the structure of the parts, which you pointed out to my attention, but which the state of my general memory leaves me only the hope that your other avocations may not prevent your affording to the subject, by the publication of them in cooperation with the detection of recrossed color images; I hope it will be welcome to you to accord the weight of your attestation, that a field is opened, and a stimulus furnished, to Philosophical Anatomists of the Brain, to follow out to its solution (what I believe optical evidence or research can no farther hope to do) the problem of the *locality at least*, if not the other great problems, of the Sentient Principle. In the present stage of the subject, it cannot but be of great moment if the Anatomists of Europe be apprised, under so high a sanction as yours, that the field is opened, and that no known fact limits the possibility of advance.*

I have the honor to remain,
Dear Sir Anthony,
Your obliged and most obedient Servant,
JOHN FEARN.

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* On the copy of my letter it is proper for me to remark, that it was re-copied from a hasty sketch written after the letter was de-

Langham-Place, September 7, 1832.

DEAR SIR,

I feel obliged to you for the compliment of being asked, as a medical philosopher, to give my opinions upon your metaphysical researches respecting the site of consciousness, where visual images ultimately yield perception to the Mind.

I regard these profound inquiries as a most valuable part of medical knowledge; for, until the old rubbish, which has long obscured the physiology and pathology of man, shall have been cleared away, it is impossible to found any rational system for the healing Art. The superstitions of Physick have ever been its greatest impediments, and if yourself and other metaphysical laborours help us out of those difficulties, we may thenceforward hope to render our Art more akin to the exact sciences, and to establish it under safe practical rules. That our perception of sensible impressions does not abide in the part, or organ, where the material impress first impinges, is, I think, demonstrable to common sense; and, also, that the forms of visual images, as well as their different properties or qualities called Colour, are merely different modes of tact upon the retina, which is organically provided as a fit place to *note all* the circumstances of light, colour, and figure.—How these are severally conveyed to the *judicial tribunal*—the mind—it may be difficult even to conjecture; but that the mind can only become cognizant of them, record them in the memory, and compare them with evidences from the other sources of sensation in the sensorium or brain, is to me self-evident. Perhaps an illustration from the grosser and more simple sense of feeling or touch may be acceptable. We feel every increase, or diminution, differing from our natural

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spatched, and therefore may not be accurate; but it cannot contain any variation of the least importance. The copy of the answer, I think, is accurate.

temperature, say at the ends of our Fingers, also mechanical pressure, and even the impresses of degrees of hardness, softness, rough, or smooth, as well as pain, when those several causes are applied; and a blind man perceives all these distinctions: now it cannot be rationally supposed that these differing impressions mentally reside at the ends of our Fingers. The anatomical facts appear to be these; certain nerves which are part and parcel of the Brain emanate from that Organ, (doubtless the seat of the Mind,) and are continued to the ends of the Fingers. These continuations of the material of the Brain are provided and ready to receive the various impressions alluded to, and they are the mere conductors of all such impressions; but their final terminations in the Brain itself connect the seat of sensation with the depository where perception obtains, and in which there are special depositories belonging to each especial organ of sense, and for every sensible living structure; the conscious presiding mind there receives its several intelligences, and directs its subjected automata accordingly.

I have trespassed thus far to show that I think with you concerning the ultimate receptacle of Colour Images, where they become cognizant to our minds. But the more refined subtleties of your profound researches I have not time to discuss.

Both human Anatomy and comparative Anatomy exhibit a manifest correspondence between the instrumental organs of Vision, Hearing, and Smelling, and peculiar structures in the Brain; and the damage of any one of those *perceptive* structures paralyzes the sense to which it belongs.

Dear Sir,
Your obliged servant,
John Fearn, Esq. AN. CARLISLE.

The reader will distinguish, in the Letter of Sir Anthony Carlisle, that he accords his judgment altogether as a Philosopher of *Corporeal Structure and Functions;* and does not express himself out of that province, which, if done, might possibly have rendered him liable to an Optical discussion demanding an inconvenient occupation of his time. But it is altogether manifest that Sir Anthony Carlisle, from his rank as a Medical Philosopher, would not have accorded, for the express purpose of being made a public document, his professional co-operation with the facts of Cerebral Vision, if he had not previously witnessed, and warmly entered into, the exhibition of the ocular phenomena which form the ground of his concurrence.

It is also manifest that the judgment in question goes much farther than embracing the mere Optical considerations. And there could be no cause, or incitement to Sir Anthony Carlisle, from any circumstance of power or influence in my situation, to accord his spontaneous and unclaimed judgment, that my metaphysical researches possess any thing approaching the importance to the Medical Art which he has deemed fit to be promulgated. If his intention, however, had been to compliment; No man can suppose he would have trifled with his own fame in the performance of it. It is at the same time a matter for the consideration of Medical Philosophers, and Medical Practitioners of every mode and grade; that a distinguished individual of the former class has avowed, and avowed so explicitly, the bearing of Pneumatology upon the healing Art—an occurrence, certainly, the more valuable when vulgar opinion, and far higher than vulgar opinion, lie buried alike under the prejudice that what it called Metaphysic has *no bearing upon the daily concerns of life.*

But what shall we say, when all this has been proclaimed to be nothing but a *paradise of fools!* How shall we sustain the shock, when an individual of the optical attainments of Sir David Brewster, in his Journal of Science for April 1831, (though until now unknown to me,) has made an exterminating attack upon Cerebral

Vision, stock and branch; and, with an animosity which, throwing aside courtesy as if it could have impeded the work of destruction, asserts that, if my conclusions are true, "all philosophers are fools, and all philosophy folly."*

If it cannot here be supposed within the range of possibility, that this procedure has been the effect of wounded egotism, crossed in its path by being precluded from a great province of Optics by a stranger on that ground; then, certain it is that an unqualified condemnation by so reputed an optical inquirer as Sir David Brewster is a matter which demands our grave consideration. In this case however, and before we come to the scientific merits of the subject, it cannot but be important to observe that Sir David Brewster has executed this scientific onslaught *previously* to the publication of my Supplement "*On Recrossed Color Images in the Brain.*" It is not but the original Treatise contains ample proofs of the subject, to unbiassed and attentive optical adepts. But the tribe of phenomena—the color images—detected and described in that Supplement are of such an obvious and irresistible nature, that I think it would have been fortunate for the fame of Sir David Brewster if he had known of their existence before he threw away the scabbard. As an omen, here however, of the claims of Color Images on exchanged sides in the Brain, it must be a matter of some moment to ask the question;—If this subject be nonsense, or nothing, Would the Royal Society have sanctioned it, as they have done, by a printed Abstract of its substance? Or yet, If being something, but still nothing new; Would the Royal Society have accorded to an entire stranger such a sanction; or would it so much as have admitted to a reading any such Paper, when, I believe, there were several hundreds of other Papers which could not obtain that distinction? Assuredly, on the first blush, this fact must possess at least a grain's weight, against the formidable gravitation of Sir David Brewster's opinion. But I pass on under this head, to a very different consideration —namely—one which involves other important philosophical consequences.

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* When I said "WE," in the place here referred to, I meant the *community;* and I do not implicate Sir Anthony Carlisle. And it is due to him to state, that he had promised his recognition long (I believe a year) before the date of this letter. Besides which, I declare, in order that no bias or feeling may be imputed to him, that, when I wrote as above to him, I had, *purposely*, never mentioned the criticisms, or even the name, of Sir David Brewster to him; and I confidently believe he had not the slightest knowledge that the latter had written against me.

Sir David Brewster, precluded from any entrance upon the province of Cerebral Vision, has turned off in an opposite direction: I say *precluded,* because I shall here shew from his own dates that he has, *after* his condemnation of my views in 1831, avowed, in his "Natural Magic" published in 1832, his intended enterprise, as a project for *future accomplishment.* Thus, in page 48 of that work, he says—" In his admirable work on this subject, Dr. " Hibbert has shewn that spectral apparitions are nothing " more than ideas or the recollected images of the mind, " which in certain states of bodily indisposition have " been rendered more vivid than actual impressions, or, " to use other words, that the pictures in the 'mind's " eye' are more vivid than the pictures in the body's " eye. This principle has been placed by Dr. Hibbert " beyond the reach of doubt; but I propose to go much " further, and to shew that the 'mind's eye' is actu" ally the body's eye, and that the retina is the common " tablet on which both classes of impressions are painted, " and by means of which they receive their visual exis" tence according to the same optical laws. Nor is this " true merely in the case of spectral illusions: it holds " good of all ideas recalled by the memory, or created by " the imagination, and may be regarded as a fundamental " law in the science of pneumatology."

On this descent (if I mistake not the first) of Sir David Brewster upon *Pneumatological* ground; though provoked to the degree which will appear in the sequel, I feel too much what is due to myself to bandy contemptuous effusions with him, in return for those which he has bestowed on me for my irruption, as I confess it was, into Optical science. But I will here, as demanded by the interests of pneumatology, state some observations on his proposed enterprise. When he talks, *as a pneumatologist*, of pictures "*painted*" upon the retina; he uses a perversion of name, and a misconception of fact, utterly in the face of all Pneumatological Knowledge: and it can be no apology that optical writers, and Dr. Reid as an Optical writer, employs the same perversion of terms. Dr. Brewster must have known that Sir Isaac Newton, even as an optical writer, felt it necessary to absolve himself from this intolerable sin in philosophy: For, under the express name of a "*definition*" of the subject, Newton, in his Optics, says—"The homogenial light and rays "which appear red, or rather make objects appear so, I "call rubrific or red-making; and those which make "objects appear yellow, green, &c., I call yellow-making, "green-making: and so on of the rest. And if at times I "speak of light and rays as coloured or endowed with "color, I would be understood to speak not philosophi-"cally and properly, but grossly and according to the "conceptions of vulgar people. For the rays, to speak "properly, are not coloured: In them is nothing else than "a certain power and disposition to stir up in us a sensa-"tion of this or that colour." The violation of philosophy thus abjured by Newton is certainly shared with you by writers in general; But the example of Newton ought to have stopped the contagion; and no length, or unanimity, of authority can prevent the necessity for purging the subject of a fallacy which hitherto has proved its bane.

As a single example of this; in Dr. B[illegible]r's Paper, read to the British Association, he says—" a *circular spot of colourless light is produced,*" when he means only that a *sensation of color of no decided tint* is produced. Such a perversion of terms as this would be scouted in any exact science; because, to talk of *colorless light, or yet of colored light*, is an absurdity to the last degree in violation of the pneumatological fact that *light is not a sensation.* If it shall suit his views to force this perversion upon Pneumatology; I affirm, it is the omen of his certain disaster, even if his intended project had been otherwise far more promising than I conceive it to be.

In consequence, however, of his intended project, the great question concerning the Seat of Perception and the Nature of Mind appears to depend for its solution upon one of three schemes;—namely,—That of Plato, as improved, or purified, by Locke and embraced by Newton, and which holds the visible object we immediately perceive to be *color images in the mind,* the establishment of which is the main object of my pneumatological and optical labors;—That of Reid, which affirms that we perceive immediately, but mysteriously, the things in external space;—and lastly, That of Sir David Brewster—that the only visual things which we immediately perceive—that is to say our *very ideas*—are *impressions projected upon the retina.*—Now, as my Treatise of Vision, and the Paper to the Royal Society on Color Images which forms the basis of my First Supplement, are both dated 1830, I could not have known of his intended project, announced only in 1832: and, therefore, I had never dreamed that I had any other scheme to contend against than that of Dr. Reid.

Very recently before my seeing his Natural Magic, however, I learned, from some repeated criticisms of my writings by my fair antagonist Lady Mary Shepherd, the existence of Mr. Crisp's " Observations on Vision." And, upon consulting that Book, I found his principal object to have been to prove that " *the projections on the* tablet of impressions upon the retina; he would certainly have recognised, at once, the principle of *coinciding images*, laid down by me, as that on which we perceive the direction of any object from the point of percipience in the mind. It is unquestionable that I never saw, or heard of, Mr. Crisp's book until July last (1832). But his book (and it contains very acute observations) shews that I do not stand alone in the "folly" of denying the principle of external direction.

To pass on, now, to the concluding consideration here.—If it be true, as Sir David Brewster has proposed to prove, that ANY of our visual ideas, or visual sensations, are only impressions on the retina; or, even, that their objects or immediate optical causes are these impressions; I should grant it very probable that ALL our visual ideas of memory and imagination are also such. But the judgment of all Physiologists, in concurrence with Sir Anthony Carlisle; as well as the whole of Cerebral Vision; are against the existence of the condition first mentioned. I should not, however, have started any objection to the project under consideration, were it not with the intent to accord my belief that Sir David Brewster may have discovered evidences to shew that, in the case of every one of our visual ideas, even those of memory and imagination, there is a *concomitant resembling impression upon the retina*; which, if so, it must be expected, will be fainter, or stronger, according to the intensity of the visual idea.

If he has discovered any such fact; it must be very interesting, and may be very important from a variety of unseen consequences: but I may venture to anticipate, it shall come to appear that the retinal impressions are *merely automatic re-actions* of the feeling or thinking mind upon the visual mechanism in the brain, extending themselves outward to the retina. The expectation of such an automatic process, as a result of all the facts of Cerebral Vision, is so natural and obvious, that, the moment I read the announcement of his project, I discerned its great thing touched; in this case, although I confidently object to it that there is *no distance of space between* the two latter, and *all distances of space between* the two former; I will here, for the moment, suppose him to be right, and then let him mark the consequence. If the immediate and only visible objects we perceive are the *impressions on the retina:* How then *can there possibly exist any principle of* EXTERNAL *direction of objects from the eye,* which is the *supposed principle* on which he has condemned all my conclusions? If the visible objects we perceive are IN *the eye;* there cannot be a flatter or more immediate contradiction than to affirm that we *see them in* ANY DIRECTION BEYOND *the eye.* It is here self-evident that, upon his own scheme, as well as upon my principle of *co-incident images,* the direction of every visible object is *in the line from the* CENTRE OF PERCIPIENCE *in the sensorium,* to what I must call its SENSATION-IMAGE ON THE SURFACE of the sensorium. And, while I have demonstrated, in two different Supplements, that the place of a seen object is its *place on the visual tablet or field of color images in the sensorium;* I have at the same time shewn that the *tablet of retinal impressions always agrees, or nearly agrees,* with the *sensorial visual tablet;* so that an impression upon the *middle of the retina* will always produce a sensation—i. e. a color image—*on,* or *near,* the *middle of the sensorial tablet.*

And here I remark, to the credit of Mr. Crisp, that he asserts, and insists, that the place of a visible object is *not in any external* direction, but that it is *purely its relative place on the retina with regard to that of other forms impressed upon it at the same time.* This, indeed, is not the true principle; because the true principle is demonstrably *within the sensorium itself:* But, still, it *corresponds with* the true principle; and proves that Mr. Crisp saw clearly the fallacy of the principle of external direction from the eye. And if he had known that there is a tablet of sensation-images in the sensorium, as well as a tablet of impressions upon the retina; he would certainly have recognised, at once, the principle of *coinciding images*, laid down by me, as that on which we perceive the direction of any object from the point of percipience in the mind. It is unquestionable that I never saw, or heard of, Mr. Crisp's book until July last (1832). But his book (and it contains very acute observations) shews that I do not stand alone in the "folly" of denying the principle of external direction.

To pass on, now, to the concluding consideration here.—If it be true, as Sir David Brewster has proposed to prove, that ANY of our visual ideas, or visual sensations, are only impressions on the retina; or, even, that their objects or immediate optical causes are these impressions; I should grant it very probable that ALL our visual ideas of memory and imagination are also such. But the judgment of all Physiologists, in concurrence with Sir Anthony Carlisle; as well as the whole of Cerebral Vision; are against the existence of the condition first mentioned. I should not, however, have started any objection to the project under consideration, were it not with the intent to accord my belief that Sir David Brewster may have discovered evidences to shew that, in the case of every one of our visual ideas, even those of memory and imagination, there is a *concomitant resembling impression upon the retina*; which, if so, it must be expected, will be fainter, or stronger, according to the intensity of the visual idea.

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To these remarks, which by no means go adequately into the subject, I merely add that if, as his project manifestly involves, the ideas of the mind must emanate forth from the mind, to be written upon the retina; and must then be read by the mind thereon, without reading which the mind cannot be conscious of its ideas; in my opinion, a more impossible supposition has never fallen in my way.—Such, however, is the Scheme which he has announced to the world as constituting a THIRD Champion on the arena of Pneumatology; and which, he conceives, will repeat to Philosophical History the lesson of the *Two Lion-like men of Moab*, in the fate of the Reidian and of the Lockeian Schemes.

As the matter of most immediate importance here; I conclude by repeating that Sir David Brewster, by alleging that the visible things we perceive are in the eye, and *not beyond* the eye, has most manifestly had the fortune to furnish his own refutation of the *pretended principle of external* direction. This result is so manifest, even in the very contradictory terms of the proposition, that I think nothing would add to its force; though refutations from optical reasoning must follow in the proper place. And I need only add, here, that *there* IS certainly a principle of visible DIRECTION WITHIN THE

SENSORIUM, and *from the* CENTRE OF PERCIPIENCE, *corresponding with* that of external objects from the eye.

In order to prevent mistakes, it may be of use to point out the following facts.—External objects certainly EXIST *in certain localities*, and therefore they POSSESS an *external* direction from the eye: but we could *never have known* this fact except from the Sense of Touch, which assures us that our daily visual images have a *cause beyond the eye*. But Touch cannot come upon *optical ground*, and give his evidence *as optical* evidence. It is certain, therefore, that we do NOT SEE external direction ; but we *learn its existence*, as we learn the existence of the objects which possess it—namely—from *use and experience:* And every act of our perceiving it is an act of *judgment*, and *not of vision*. But the act of judgment follows that of vision *so instantaneously*, that no man, except from reasoning, can believe it is not an act of vision. As a proof of this, both Dr. Hibbert and Dr. Brewster admit that *spectral apparitions* are confidently taken by men for external objects, though no external object exists as their cause. No man will pretend that there is *any visual element* in a vision that has an external object or cause, that is not in every vision of a spectral apparition. If, then, there be *no such thing as external direction in the one case*; How can there be any in the *other?* Have the actors in our dreams any external direction from the mind; although, according to Sir David Brewster's project, those actors *must be as real* as any that we *properly* SEE when actors are before us on a stage?

It must here become obvious that, of all the three schemes in question, that of Dr. Reid is the *only one that admits a possibility* of our SEEING external direction. If, as he assumed, we SEE *external objects immediately*; we, then, must SEE *external* direction. And he was well aware of this, and therefore stoutly maintained the pretended principle in question. But the bare proposal of it, either upon my scheme, or on the proposed scheme of Sir David Brewster, is a most certain absurdity.

To those who are fully in the subject, I think, there cannot appear a doubt but the question resolves itself into this:—*Is external direction* a thing that we SEE, or only a thing that we JUDGE? Dr. Reid holds it to be a thing that we SEE; and Sir David Brewster holds this after him, because he *expressly calls* it "*seeing*," as I shall shew. This proves that he is soundly asleep with regard to *any distinction* between *whether* we SEE it, or only JUDGE it. It is from this that his great mistake arises. Now, the distinction being here pointed out; I hold it to be a thing that we JUDGE: and Dr. Porterfield, upon another ground, has held the same.

The depending great result is this: If external direction be a thing SEEN; then, Cerebral Vision is a dream. But, if external direction be *only a thing* JUDGED; then, Cerebral Vision is a reality.*

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* Dr. Reid, in his "INQUIRY," chap. 6. sect. 18, page 336, says, in speaking of Dr. Porterfield's views,—"We agree with this "learned and ingenious author, that it is by a natural and original "principle that we see" (mark the word "SEE") "visible objects "in a certain direction." But I here observe, that Dr. Porterfield himself saw the important distinction which I have made in my original work and insist on. In that Treatise, I have quoted him (from his 5th Book) for talking of the means which "by sight "we come to judge," (mark here the distinction he makes between SIGHT and a consequent JUDGMENT) "of the situation of external "things." And I have there stated that his repeated expressions go to shew that he meant we ONLY JUDGE of external direction. This, indeed, was *only being consistent* with his whole general views: because Dr. Porterfield maintained, throughout, the existence of a *Sensorium* and our *perceiving external visible things by means of images.* The quotations here given must be of great importance, in order to shew that Sir David Brewster *altogether confounds* the grand critical distinction between seeing and judging of the direction of EXTERNAL objects.

Sir David Brewster ought to have known, because all the anatomical world knows, the momentous distinction which he has

## TO SIR DAVID BREWSTER

As Conductor of the Edinburgh Journal of Science
for April, 1831, &c. &c.

SIR,

As it is certain that my extermination as a member of the scientific community must be completed by the power and credit of which you have availed yourself to effect it, unless I can counteract such a result by withstanding the attempt; there cannot be a doubt that the motive to this letter is that of self-preservation. And here, in the outset, I declare I entertain no vindictive feeling towards you. Let, therefore, every honest man observe, what spirit is manifest in my present writing, and what in yours: And let him pronounce, on the merits of the case, that sentence for which God will requite him.

One distinction, indeed, every man must observe between the two statements. My oppression is, and long has been, to the last degree grinding: and my literary peril is now rendered by you no less than imminent, in case, as has appeared too ominous, the scientific bulk of the British Community, as such, forms the only class

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thus confounded; that is, he ought to have known that the JUDGING OF EXTERNALITY, (AT ALL,) IS NOT AN ORIGINAL OR CONNATE LAW OF THE MIND, although his predecessors on the same ground—Doctors Porterfield and Reid—strangely maintained that it is. Had the youth, when couched by Cheselden, seen the objects around him AS EXTERNAL objects; Sir David's cause had been gained: But he saw them "AS TOUCHING HIS EYES;" and Sir David's cause is lost.

Besides all this; It is certain that the direction of an external object, from that part of the retina which is impressed with light from it, is, in most cases, such that the *opaque sclerotic coat of the eye* is *right between* the object and that point;[b] so that, we can *no more properly* SEE the object through it, than we would see it through a stone wall.

The philosophical eyes of Europe will be upon England, in the part which she shall take in this controversy.

of Englishmen who do not revolt on the witnessing of flagrant injustice: And these truths require, of course, to be adequately stated. But you consign to a scientific death in few words, and with an air of indifference which few would evince in the crushing of an insect; and have volunteered, toward a man in his decline, who had done his work and whose future labor the hand of nature had foreclosed, a most supererogatory insult, in the form of a mock advice by what *future* course of amendment, moral as well as intellectual, he may "*do something that will give him credit.*"

On an assault which, (as I am shut out from the great channels of promulgation,) leaves me absolutely nothing, but the contempt of all men; I am still bound to employ no tone but that of complaint. I shall therefore only remark, here, that discourtesy, as well as courtesy, has its laws; and, harsh as they are, they do not tolerate an onslaught, or an aggression, which regards no tie. With this single specimen of the humanity with which you have exercised your power, from a vantage ground which must already have spread the defaming of me over Europe, I proceed to the merits of the case in the order in which their heads are enumerated in the title of this letter.

### HEAD FIRST.

#### *Your assignment of my Moral.*

BY one of the numerous impediments to which I have been long subjected, through a decline of constitution and inability of attention, I missed (I know not how) until the commencement of this reply, the fact that you have, in your "*Edinburgh Journal of Science for April*, 1831," (*that is a year and a half ago,*)—inserted strictures on my Treatise of Cerebral Vision: And thus, all the evils of which I have to complain have been operating the while, in their spread over this and other countries: while I must have been viewed as acquiescing under their onus. I first learned their existence from a friend, owing to the mere accident of my mentioning your "Natural Magic," which I had just purchased. And he then mentioned his foreknowledge of the thing; but had deemed it too utterly out of the pale of toleration to call my attention to it. It can hardly be doubted but that both he and other friends have tacitly thought that, as coming from such authority as yours, the strictures were such as I felt I could not answer.—You however commence the article in question in the following terms.

"MANY of our readers are no doubt acquainted with "the pneumatological writings of Mr. Fearn, and with "the correspondence which they occasioned with the late "Professor Dugald Stewart, and which has been pub"lished in the *Parriana*, or notices of Dr. Parr. Our "illustrious countryman did not view the speculations of "Mr. Fearn with a favorable eye; and to Mr. Stewart's "great influence over the public opinion Mr. Fearn attri"butes the total indifference of his countrymen to his "intellectual labors. He has therefore made a direct "appeal to the philosophers of France, to whom he dedi"cates his present work; and if it should meet their un"qualified censure, he says he shall be content to have "it supposed that his previous writings are of no better "complexion." (You ought here, in fairness, to have inserted *my accompanying remark, namely*—"*although* "*the matter is not my subject.*" But you go on to say— "Mr. Fearn then makes a second appeal to the Lord "Chancellor Brougham, and in the subsequent part of "the work he calls upon the editor of this Journal by "name to avow his assent to the 'Laws of Cerebral "Vision.'" You then, in a new paragraph, to give the assertion more notoriety, say—

"The strictures on Mr. Stewart's conduct, in giving "his opinion of the pneumatological labors of Mr. Fearn, "have but little tendency to encourage others to under-

"take the same ungracious task." And, having premised this imputation upon me, you proceed as will appear in the sequel.

Now the moment which you chose, for thus fixing upon me a stamp of odium, was next after that in which yourself had recorded the act of my deep complaint, to our own and to other countries, as laboring under literary oppression, not indeed from critical condemnation, but from critical silence;—a moment when any fell adversary might seem safe to say—"persecute and take him, for there is none to deliver him." It would be inconsiderate in any one to think that the hurt in this case was of no baneful consequence. The man who could attack, with tenor of deep import, (and such indeed did mine from resistance of my right become) the venerable, the meritorious, and highly distinguished Professor Stewart, for no deeper cause than the "*not viewing his speculation with a favorable eye*," must not only be lost to every sense of urbanity, and decorum, but he must be much worse;—he must be unsafe in every sort of intercourse, scientific or social. Let every man lay his hand upon his breast and say, What would be his feeling, and his rule of action also, toward any one upon whose character such a stigma had been justly affixed. Would he seek either friendship or intimacy, or yet willingly mix himself up in scientific discussion, or ordinary acquaintance, with a being so resentful, and unawed by worth, or eminence? It is certain that even the imputation of a want of probity could not make a man more shunned, than that in question. Thus, when bent upon the act of sweeping my scientific labors from the ken of the community, and when (it will be shewn) you had premeditated to appropriate to yourself *my originality in the field of "Pressures upon the Eyes;"* you commenced this act by stamping a mark of odium upon my name, and turned me forth, most certainly to be unsympathised with, and to scare every delicate, and every decorous person, that might otherwise be disposed either to discuss, or defend my labors.

It is, when pointed out, a striking coincidence of proceedings, that you have herein imitated Professor Stewart; though you have gone far beyond him. For he admirably employed the tact of *reiterating* upon me the imputation of my having taken "*offence;*" although I, first and last, delicately and studiously expressed myself as being utterly without any such feeling. I trust, the keeping of the two procedures, in the logic which they both alike evince, form their own commentary, and shew the wisdom in its generation, as well as the power, with which I have had to contend.

Here I might stop for a moment, and ask,—whether any who have conversed with me will charge me with being intolerant of opposite opinion, or out of the pale of urbanity, or candour, on any discussion of my views. I deceive myself if I might not even hazard the asking, if they know any man who they think would more respect the public dealer of a fair blow at my conclusions, than they have found me. But I resume the matter under consideration.

Now, the truth of the case which you have thus misrepresented is that, so far was Mr. Stewart from *ever avowing any* difference from my views that could call up from me the least degree of resentment, that, on the contrary, HE HAD EMBRACED—*i. e.* TAKEN UP—*my views;* and had then persevered, against my several *private appeals to him through a course of three years,* that he would *merely publickly acknowledge my "priority"* in the matter. In which patient appeals, *instead of taking up any tone of offence,* I always put it upon the supposition that he had not known of my being before him. And thus he drove me, by oppression, to a *public* appeal. As you have read the account of the matter in the "*Parriana;*" and have referred to that work; it is impossible you can say you have been misled. And, besides this, from your accredited office and responsibility, you were *especially bound to be not* misled in throwing a moral and onerous imputation upon any man. I can have no doubt in appealing such an act to the judgment of good men.

Of the many critics of the day on the *Parriana*,—to the account in which work you refer,—there are a number of them that have extended their attention to the correspondence. And, so far as I am aware, not one of them has uttered a single syllable on the side of Mr. Stewart. The least favorable to me among them, that I have seen, is that given in the *Times Journal for Sept.* 5, 1828: which I shall transcribe here for a double purpose, and because its internal evidence proves it to be the effusion of a partizan:—

" We have now waded through the whole of this bulky " volume with the exception of 107 pages"——" By a " Mr. Fearn, and giving an account of his actual corre-" spondence with Dr. Parr, and his attempted correspon-" dence with Dugald Stewart. We cannot pretend to " analyse this, and for this reason—we have found it im-" possible. Thrice have we attempted it, and thrice has " sleep descended on our eyelids. But our failure is im-" material." &c. &c.

Here then, in the first place, I ask—Would this writer have betrayed his chagrin, at the manifest merits of the controversy, by so glaring a virtual acknowledgment of their being against Professor Stewart, if he could by any stretch of ingenuity have availed himself of a pretence that I had attacked that venerated individual for his ONLY "*not having viewed my speculations with a favorable eye*"?

It may be sufficient here to say—It is certain the *Monthly Review for September* 1828 did not strain its eyelids when it, *a second time and after a lapse of years*, awarded the decisive and energetic sentence which it has expressed upon the controversy, in its remarks on the *Parriana*.

But, with regard to the *Times Journal.* It had, some time before, and not at my instance because I had never obtruded my labors upon its attention, published remarks upon Dr. Parr's "*Bibliotheca*;" and it chose to insert, not without some note of handsome expression toward me, the remarks which Dr. Parr had written on the fly-leaf of my Essay on Immortality, which also were published by several contemporary Journals. The writer in the Times did not *then* designate me as "*a*" Mr. Fearn, and thus evince a spirit which must reflect upon himself more than it does upon me. Up to that period, however, it is in evidence, the Times Journal was not hostile to me. But we find, the ungracious, and in part unfounded, passage above quoted was issued from the Times the moment I appeared in collision with Mr. Stewart. I do not know, now, that the Times is hostile to me. But I have here to add that, I addressed to its "Editor" a letter; in which, without imputing the matter to him as his writing, I merely "*put it in his option to be the first*" to contradict the lessening imputation of my having attempted a correspondence with Professor Stewart. And, though I have waited patiently these four years, for justice upon this detraction, my letter has never been noticed. Will any man *now* say that I have been grappling with a shadow, in complaining of general oppression under the influence of Professor Stewart's name, when, in addition to an exclusion from all the Quarterly Publications, I cannot get redress for a stigma in the Times Journal that was undeniably inflicted to lower me in my predicament of corresponding with him?

If the poorest artizan, who could shew the Times vouchers for having been (in the popular phrase) his "constant reader" for more than a quarter of a century, had appealed to it in any such case; Would the Times have refused justice, when the matter to be rectified had occurred in its own columns?—But the hour has come when the Gentlemen of the Times Journal must certainly discern, that their honor is concerned to speak out on the work that is now so manifestly in progress. I call upon them, therefore, apart from every other office; (I do not name them, because it would infract a usual courtesy; but their Names must go down with the history of what I have been subjected to;) to render to the case that justice which they have, however it may have been unintentionally, impeded. If they deem their ingenuousness concerned to answer this call, from one whose intentional course of life I think they will not deem other than meriting consideration, I shall be satisfied. But, if not,—then,— Will any man say that I am not a sacrifice to *influence?* *

To return, now, and conclude with regard to this part of your conduct; You have, as the initial step in the act of crying down my whole literary life, fixed a stamp of odium on my moral disposition; and, in so doing, have taken a time when the merits of my controversy with Professor Stewart had slept in the minds of all but a few *philosophical* readers, and when therefore your misrepresentation of the fact must have impressed the far more numerous of readers of *Science,* with the belief that the whole matter was only a manifestation of a resentful disposition in me. Let all men of upright minds judge you upon this act.

I pass on, to the next head of your aggression. And it will be seen whether, or not, the same spirit, with an increased bent on my destruction, be made evident under every one of the heads in question.

## HEAD SECOND.

### *Your exterminating implications, to the total discredit of my Writings, in every department of my labor.*

As I shall welcome you, under the next head, to the result of your optical criticisms of my views; I shall not here enter into their merits, but shall merely, in the first place, point to the *spirit* in which they are conveyed; and shall then consider only that part of your conduct immediately here referred to.

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* That the *Times* feels well toward you, is shewn in its columns. But I shall trust to its sense of what is due to itself.

Having, in your first strictures pronounced upon all the early Sections of my Treatise the sweeping sentence due to "fools," and to the "philosophy of folly;" you then proceed to take up the *Fifth Section*—namely, "ON VISION WITHOUT EXTERNAL OBJECTS;" which, you add, is a "subject very little studied, and one on which it would be "difficult to make numerous experiments without stum-"bling upon some useful or important fact." From your *general* tenor, I must here understand that, I have not in the course of my numerous experiments (and they certainly have been very numerous and with repeated courses,) so much as stumbled upon a single useful or important fact.

Now, upon this insinuation, I ask—Is there a man possessed of a particle of honor, or ingenuousness, who will read the fifth section in question, comprising thirty-two pages of matter, with a plate, and recounting a systematic course of pressures upon the eyes; and, then, will put his name to an assertion that this ought to be designated a course of *stumbling*, or that no important fact has been the result? And, if no such man be found;—then,—Is this latitude of insinuation tolerated on any high arena of argumentation? Or, would you have dealt out the same toward any beneficed Professor, to whom the channels of reply are open, if he had published the *very same* course of pressures that I have described?

But this is not all: For, in the next paragraph, in giving some details of criticism, you have uttered the assertion that, in my course of pressures in question, and in my account of the experiments producing the *luminous circles*, I "*treat only of the direction in which they are seen.*" Now, besides treating of the *directions*, I have treated momentously of the *re-crossing and the distances between* the circles, which you will find to be of vast consequence: and, also, of the "*correspondence of the sizes* of the seen circles with the *degrees of pressure*;" of the *vividness*, as well as the size, being in proportion to the *pressures*; of the *varying colors* of the circles, as the pressure is *varied*; &c. &c. comprising a descriptive and systematic account of their phenomena, on re-crossed sides, and in all cardinal bearings and distances; which, I believe, I have by no means been done justice to in this enumeration. Where, then, is the fidelity of your report?

On the credit side of your strictures, to counteract the general tenor of condemnation already alluded to, you have not accorded so much as a syllable in admission, that *any part* of my whole Treatise of Cerebral Vision evinces the detection of a single fact, which could relieve the eye from the contemplation of one continued extent of presumptuous ignorance!—*Is this the Arena of Philosophy?*

You indeed say, that "ALL my views are original:" And this is an important concession. But you do this only to add that, I am in the face of all philosophers, and all philosophy. Even the Fourth Mode of Vision has not called forth from you a syllable of acknowledgment; although you have owned its validity by replying to its conditions, and must have known that Newton had, unsuspectingly, denied its existence. *Is this liberality?*—It must be owned that a whole volume of original views, on the subject of optics, is a large mass to be totally made up of nonsense.

IN FINE.—Having finished your office of Critic; and condemned the alleged culprit to a total exclusion from Optical ground, as far as concerns his *past* labors; you then invest yourself with the Monitorial office; and, with the authority of a Judge sitting on the highest tribunal, whence law and morality come with the most impressive weight on the feelings of all who listen, you deliver the following lesson for his *future conduct*:—

"We regret very much that we are obliged to give so "unfavorable an account of Mr. Fearn's Optical labors.

"If he will only leave the field of speculation, and, with "some feelings of respect for his predecessors, will devote "himself to the hard labor of experiment and observation, "we have no doubt that he will do something that will "give him credit and reputation."

Now this chain of *implications*, when turned into the chain of *assertions* with which it is strictly identical, is as follows;—that I have *never* labored hard, in experiment and observation;—that I have *never* had so much as *some* feelings of respect for my predecessors;—and lastly, that I have never, in the whole course of my labor in every department, done any "thing that will give me credit."—Let us therefore here observe, What are the relative situations of the parties, from, and to, whom this flow of scoffing was directed.

It was not that of a nameless writer, to whom no man of gentlemanly feeling, and far less any who had labored and merited any thing in science, would deign to return a smile of contempt: But it was the avowed act of a man on whom his Majesty had bestowed the honor of knighthood for his scientific attainments, and, consequently, whose elevation and place in the community ought to have been safely reckoned upon as a guarantee, to his King and Country, for his observance of at least a treatment that could be endurable to the feelings of any other gentleman who had handsomely appealed to his judgment, and without which guarantee the arena of science must become the scene of every latitude.—And it was thrown in the face of a man so old, as to have commenced an honorable life, I believe, before you were born, and whose life since then has never rendered him a fit object of personal treatment that would flush the face of a boy;—a man, moreover, who had never intentionally crossed your path, and whose only disrespect, or provocation, to you was his complimenting you by an appeal, at once, to your judgment and your ingenuousness;—One who has, at least with great labor, produced a number of volumes that are not without witnesses in the world; and who, it is certain, has been pronounced, both by English and by Scottish criticism, to have been right in a controversy of great moment with your "illustrious countryman." On this act, therefore, I say—Let men of right feeling judge you.

What I have yet said, here, only applies to the outrage of my feelings, if it be admitted that I have a right to have any. But the fact of the case obliges me, now, to point to the *consequences* of your proceeding. When it is reflected that I have been thus shorn of all credit by a person of your rank in the scientific community; and through the channel of your accredited periodical, which has now unfortunately been carrying this sentence not only throughout Britain, but also through Europe and America; is it possible to deny that I *must* have been a sufferer from this act, to a very serious extent, in the sale and promulgation of my writings on Cerebral Vision? It is, no doubt, requisite that works of criticism should be allowed a great latitude; in so much as may often afford shelter not only to illiberality, but also to malevolence. But your *Criticisms are not here in question:* You had *finished them;* and were acting as a self-made monitor, in instructing me *professly for a future end.* When, therefore, my time of life, and well-known frequent jeopardy of constitution, are considered;—Is there a man, unless it be yourself, who will set his name to a denial that this last supererogatory act (over and above its being unfounded in what it virtually asserts) is a deliberate piece of gratuitous and unalloyed evil, that had not one particle either of mine, or of the public good, for its object?

On your adopting the smooth tone of *monition,* it could never be suspected, by readers in any country, that a man so raised, and backed by all appliances, would put on the robe of peace—nay of friendship—with a purpose of hostility. But certain it is that all readers, who know nothing of me, must conclude I am *a young* offender, *kindly schooled;* and, to such readers the act will not appear as being even impertinent: while, as coming from you, every syllable of it is full of pertinence, and of proscription of my name, wherever your word has been received as that of a man of probity. Upon this, therefore, I plainly inform you, that my destruction must not be effected by your procedure.—If necessity render it imperative for my existence; I shall consult competent opinion, whether a jury would not pronounce that the object of your distinct supererogatory act was to prevent the sale of my writings by bringing me into contempt. If the Country shall rouse from its apathy on my continued oppression; that is the National Tribunal to which I desire to appeal. But, if this can fail; you may rely on it, you must abide by the consequence unless you make such reparation as remains in your power, and which I here call upon you to do. I think, there is no ingenuous mind but would be glad to see the poor enriched by the result, while it saw an individual rescued from injustice. And farther evidence, as to spirit, remains behind.

## OPTICAL INVESTIGATION.

### *Your supposed refutation of the whole of Cerebral Vision, by the single assumed principle of External Direction.*

### *Second Refutation of that Principle.*

NOTWITHSTANDING you have indisputably cut yourself off from EVERY principle of *external* direction, by your proposal to prove that we see *no objects but the retinal impressions in our eyes;* I am here to consider you as presenting yourself on the inconsistent ground, of refuting my views by a principle of visible direction *beyond and perpendicular to* the retinal impressions. By way of Preface, therefore, to my offering several very distinct refutations of your reasonings, in addition to that above alluded to, I shall advert here to the reasonings of Dr. Wells, in his opposition to Dr. Reid on this very principle; because I have, in the Introduction to this Letter, critically quoted your own expression, to shew that you unite with Dr. Reid in the assertion that we "SEE" external direction.

### *Concurrence of Dr. Wells with me on this Subject.*

Dr. Wells has strictly demonstrated, through a series of propositions, that we *neither* SEE *nor* JUDGE objects to be in a direction perpendicular to their images on the retina. Some of his proofs of this fact are unanswerable. And, being aware that the advocates of Dr. Reid's view would seek shelter under the principle of *corresponding*, and *uncorresponding*, parts of the two retinæ; he combats this last principle by a train of *anatomical* reasoning; but which, at best, is questionable and inconclusive. It appears, therefore, that he failed to prevail against Dr. Reid owing to the *pre-established influence* of Reid's supposed principle, and to his inconclusive reasonings against the plea of *corresponding points;* and, also, to his not having been able to substitute a tenable theory of *single vision*, which last he *professly built upon* his theory of *external visible direction.* Certain it is, that Dr. Wells has not produced that species of case which could, *upon the ground of corresponding points*, explode the Reidian and your own view of the subject.

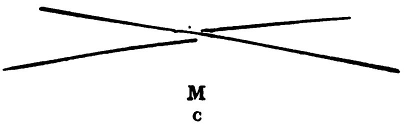
To take, here, the matter of his first and cardinal proposition: When we look with our two eyes through two holes, and see them as *one same hole;* we shall find, upon closing either eye, that the *direction of the seen hole does not change*, but that, whether we see with both, or with only one eye, the apparent one hole is in the direction of what Dr. Wells calls the *"common axis,"*—that is, in the *middle between* the eyes, and right before the nose.

Upon this, Dr. Reid, or yourself will affirm that the reason is because the two retinal impressions, from the two holes, are *upon corresponding* points of the two retinæ. And thus, you take your refuge in this last reason whenever the principle of an *external line perpendicular to each* retina is manifestly shewn to be false. The following experiment however, I think, will set this matter at rest. When I hold up my finger perpendicularly, at any point of intersection of the two optic axes, before the nose; and look stedfastly at the finger with both eyes; *I confidently judge it to be* RIGHT BEFORE THE NOSE, and Dr. Wells, and even yourself, would hold this unanswerable. Upon this, however, you will urge that the result is because the two images of the finger fall upon *corresponding points of the retinæ.* But *What is the fact?* The fact is that, although the principle of corresponding points is a *real and true* principle, (as I have proved throughout,) it has NOT HERE BEEN CALLED INTO ACTION,—for I have NOT *seen,* (*and* CANNOT without art see,) the finger with both eyes, though I have LOOKED *at* it with both, and, if I had not known better from experience, should confidently believe I had *seen* it with both. Here, then, when I have seen my finger with *one eye only;* and have, without doubting, *judged it to be not in any direction* IMMEDIATELY FROM *my* EYE, but *immediately in a certain direction from my perceiving* MIND; What becomes of the pretence of SEEING *in a line perpendicular to that point of the retina that is impressed?* Now, perhaps ninety-nine persons, or at least a large number, in every hundred, *never in ordinary* see any object with *both* eyes, though they all *confidently believe* they see with both eyes. And thus, it is only in rare cases that the principle of corresponding points *ever comes into operation.* There remain a variety of arguments, upon this ground; but they cannot have room to be inserted here, with exception of the following.

Dr. Wells, in his farther propositions, has fallen into a mistake in concluding that, because an object is seen to the left with the right eye, and to the right with the left eye, the one eye contradicting the other, the object must be judged to be in the *middle between* them. Because the fact is that, if an object be situated in *both* optic axes, this *contradiction of places* never can happen, since, if it did, it must follow that we must see the object *double* every time we saw it with both eyes, if it were at any nearer, or farther, distance than the intersection of the two optic axes. Perhaps, Dr. Wells would reply here, that we DO see the object double in every such case: but, to this I reply that, we DO indeed see it double, but this is because we DO NOT see it in BOTH the optic axes, but see it from impressions upon UN*corresponding* points of the two retinæ. Not one of his supposed cases, therefore, of seeing to the right, or to the left, with either eye, when the *object is in the axis of that eye,* can be true: which I have demonstrated by the example above given. And in order to confirm this, I here assign the REASON of it. The reason, then, is that the *Axis of the Eye* CORRESPONDS WITH *the Axis of the Sensorium;* so that a retinal impression on the *Back Pole or Middle of the Eye travels backward through the cerebral region,* and produces a *Color Image* in the *Front Pole or Middle of the Sensorium:* And this *Color Image* is beheld by the MIND, from her POINT OF PERCIPIENCE *near the Centre* of the Sensorium. Hence, a *Color Image* is seen by the Mind in the very same place, whether we see it from an impression on the *axis of one* eye, or from an impression on the *axes of both* eyes. And, when we do *not see* it thus, at any time when we *think it is in the axis* of the eye, we may be assured it is NOT *in the axis.*

Let us now, for a moment, examine the *nature of correspondence,* in this case; even *when it* IS called into operation. In any case of SEEING an object with both eyes; it is plain, the two retinæ *do not correspond* BEFORE the eyes; because, *not only is there no means* of agreement BEFORE the eyes; but, besides this, the eyes *notoriously contradict* each other's reports of direction, as I have just shewn. The word *correspondence,* then, has *no meaning* if there be not two post-roads behind the eyes, and a post-house where the two impressions meet. Such a point, of meeting and co-incidence, affords to the word correspondence a meaning, and a certainty of its truth; but, without this, there certainly is no sound more void of meaning than the word "*correspondence*," in the case in question.

Dr. Wells has cited indubitable anatomical authorities to shew, that there are extant *a number of errors* regarding the structure of the *eye,—crystalline,—retina,* &c. and their supposed functions of *transmitting rays,* and *assisting* our *judgment of direction.* And, keeping this in view, he believes that he works out his own theory *of single vision, altogether upon external ground;* although he has exploded the external principle of *perpendicularity,* of Dr. Reid and yourself. Had Dr. Wells once entered upon the ground behind the eyes, or cast at all in this direction; he might have come, in the course of experiment, to the curious fact, (pregnant, doubtless, with various consequences to the problems of vision,) that the *retinal impressions from the* two eyes *do not discharge* themselves on *one same* SENSORIAL TABLET; but that each eye discharges its impressions upon its *own proper Tablet,* in, *or on,* the sensorium. In my Supplement "*On the Sensorium investigated as to Figure, by a course of Pressures on the Eyes,*" I have demonstrated, at full length, that the two respective sensorial tablets of color images are NOT IN THE SAME PLANE, but are *inclined to each other* in a small angle—thus: And that, although the two tablets must appear to the Mind (SEE *the* PLATE *to the* "*Sensorium Investigated.*") at M (*i. e.* from the *centre point* of the Sensorium,) to be, in a *great part of their lateral extent, one same tablet;* yet, each tablet has a WING *on the same side with, and appropriate to, its own eye;* which wing, on each side,



projects farther, *in its lateral extent*, than the verge of the other tablet, and thus proves its distinct existence.

Here, by the way, I am obliged to advert to the fact that, although this, my third or fourth *published* course of pressures, with such results as the above, was published in April 1832,—you have read to the British Association in June 1832 a paper upon Pressures on the eyes, wherein you alledge that, "*so far as you know*, the production of light by pressure upon the eye-ball has *never been carefully examined*." In that paper, then, which the very assertion I have here quoted, and other evidence, proves to have been *your maiden* paper on the subject, and which, *when published in August* 1832, makes, with all its comments, *no more than full three pages* of your Journal, you have thus taken to yourself the ORIGINALITY and PRECURSORSHIP in the *Province of Pressures upon the Eyes*. But, of this, more in the sequel.

In the interim; boasting attack forces from me, however unwillingly, boasting defence.—From the SEEMING EQUALITY *of the inclinations*,—namely—the inclination of the *two sensorial tablets of color images*, and the inclination of the *two axes* of the eyes, we may doubtless presume that they *correspond in some way or other*. Has your "careful examination," (*not filling*, but *only ruminating in, three pages* of your Journal,) led to the discovery of any such deep-hidden fact; or, to any fact that will hereafter be named in the same day with it? Has it led to the detection of the "*Sensorial Aberrations of the Eyes?*" Has it led to the fact that we can see objects *thirty*, or *forty, or more* degrees *behind the Equator of Each Eye?* Far more momentous, though far less hidden;—Have you discovered that the peacock's feather (the "*circle*") is seen, *not* (*as you affirm*) "*on the opposite side of the eye-ball to that where the pressure is applied*;"—but is seen FAR BEYOND *the opposite side of the eye-ball*, to the *right, or left, of the whole eye; so as to be absolutely and measurably in the* *direction over against the* MIDDLE OF THE OTHER EYE, which fact, of itself alone, critically establishes Cerebral Vision? I might continue thus: But, Why need I go on to crucify your three maiden pages of discoveries from Pressures on the Eyes, if I have said enough here to release my labors from the total contempt under which you have buried them?

### *Concurrence of Sir Charles Bell.*

Having always been absorbed in very different fields; and not supposing that any *recent* Author had appeared, or would engage, in a subject that has so often baffled all attempts at its solution; I was not, until this very point of my present Letter, aware that (now) Sir Charles Bell had written upon it; and had been combated by you, in your *Journal for November* 1825. In your strictures on that occasion, you quote Sir Charles Bell in the following words:—"When an object is seen, we enjoy two senses; "there is an impression upon the retina, but we receive "also the idea of position or relation which it is not the "office of the retina to give."—And presently after this, you quote him as follows—"it shows that vision, in an "extended sense, is a compound operation, the idea of "position of an object having relation to the activity of "the muscles," *i. e.* muscles of the *eye*. This you deny: and, among other supposed refutations of it, you think that, when a man *twists his head round,* and looks at an object without having moved his eye, he refutes Sir Charles Bell's position.

Now, in order to show, here, that I altogether concur with Sir Charles Bell; *and that I did so before I knew that he had written;* I here transcribe a passage from my "*Supplement on Color Images in the Brain,*" *published in* 1831, which I gave in the spirit, and as an illustration, of my proposed principle of "*Coincident Images*" in my Treatise published in 1830, as being the *true principle of Visible Direction.*

"Every spectator of a scene *must allow* (*and nature has well taught him how to do so*) for the VARIATION OF HIS EYE, as the mariner allows for the *Variation of his Compass.* Thus, if a man know that his head is twisted far to the right, and his eye twisted far to the right in his head; he then knows that the object he sees is *nearly behind him:* And this he does on the very same principle that the mariner, when he is steering '*North*' by his Compass, and knows that his compass has 'Two Points' of West Variation, knows that he is *not steering* 'North,' but is steering '*North North West.*'" That this is a legitimate illustration of my principle of "*Coincident* Images," published in my treatise in 1830, (*and which you have read, though you do not allude to one syllable of it,*) is indisputable. And it is a coincidence with the position of Sir Charles Bell altogether striking; because, assuredly, it amounts to this—that "*vision, in an extended sense,* IS *a compound operation:*"—by which I mean that *proper vision is of a Color Image on the tablet of the sensorium,* seen from the point of *percipience* in the mind; BUT *that we must compare this proper vision,* with our knowledge of the *posture of the eye in the head,* and of the *head on the body,* and, if need be, of the *body itself* with relation to the earth, or heaven.

As I cannot here seize a moment of time, to consult Sir Charles Bell's Paper, I know not whether our respective views coincide any farther. But, if we diverge in opinion from this point; I trust the liberality of Sir Charles Bell will accord a due consideration to a course long so unexpected by me, as well as by him and all others, which has carried me into the region behind the eyes. And I here announce my intention to send to him, immediately, a copy of this letter; and to ask the avowal of his assent, or dissent, to the fact whether vision has been, as the result of all my publications on the subject, carried into the brain,—as it cannot but be of great consequence to the living world, and of interest to those who shall succeed them, to receive the decision of so high an authority. I cannot doubt that he will consider the philosophical world as looking for the avowal of his decision. And his fame, both now and hereafter, will certainly be identified with the side which he may take.

### *A Third Refutation of your Principle.*

You having tacitly assumed that the whole of Cerebral Vision is embodied in my 14th Proposition, although that is only the *first illustration* of what I have called the *Fourth Mode of Vision*; You thereupon write down the two words " COACH HORSES," as a substitute for my example of a *coach and of horses yoked to it*; And you then say—" Let us place the edge of a sheet of paper " between H and H, the opposite edge touching the " nose; so that when we close the *right* eye, we shall " see only the COACH, and when we close the *left* eye, we " shall see only the HORSES. Now since an inverted " picture of the COACH, and also of the HORSES, is " formed in each eye, a person behind the two eyes will " see these two inverted pictures thus SƎSᴚOH HƆⱯOƆ. " The coach and horses are now no longer in their natural " arrangement, as Mr. Fearn expresses it, but in two " unnatural halves turned back to back; and, as we never " witness any such preposterous phenomenon, he concludes " that we do not see immediately from the inverted im- " pressions in the eyes. Hence he is led to presume the " existence of *some cerebral mechanism* by which the in- " verted impressions are rectified."

Now, as the wholesale contempt of my Treatise, by which you have outraged every consideration of lenity, has excluded you from all claim to it, I have no hesitation in saying that, with all your arrogance of infallibility, you have in the above statement of the case fallen into a misconception OF THE CONDITIONS OF MY PROPOSITION so palpable, as I could not have expected in a mere tyro. And, to this, you have *added another mistake,* in the *substitute* which you have proposed for my example of a *coach and horses yoked to it.* The exposition of both which matters, I think, may tend to moderate any future tone which you may deem decorous to adopt toward my labors. I shall wonder, more than I have wondered yet, if men of optical science be not astonished at the following statement.

Thus,—*first,*—you have conditioned, on my part, a "CLOSING *of the* RIGHT *eye,* and seeing ONLY THE COACH;" and, then, a "CLOSING *of the* LEFT *eye,* and seeing ONLY THE HORSES:" when the FACT is, that the very statement of my 14th proposition, and the very essence of the *Fourth Mode of Vision,* both *insist on the condition that* NEITHER OF THE EYES ARE TO BE CLOSED, but that we are to "SEE AN EXTERNAL OBJECT, ONE "HALF OF IT WITH ONE EYE, AND THE OTHER "HALF WITH THE OTHER." You will find the *difference in point of consequences,* between the two conditions, to be *optically immense:* and you can have no excuse for mistaking the matter; because you have correctly quoted the title of my 14th proposition, in which the words, here repeated, are given in CAPITAL LETTERS.

*Secondly*—You have fallen into the farther capital mistake of writing down the reversed words "SƎSꓤOH HƆ∀OƆ," as a *substitute* for the *impression* of a COACH in *one* retina, and an impression of its HORSES in the *other;* and your mistake amounts to this:—The impressions of the words SƎSꓤOH HƆ∀OƆ on the retina are *only reversed impressions; they are not turned preposterously back to back.* They are, indeed, in *one* sense unnatural, or preposterous, in their arrangement; but this arrangement, (although it includes the turning of them *upside down,*) is only analagous to a coach and horses *turned* FROM, *instead of being turned* TOWARDS, *London.* But, when we see a COACH with the *left* eye, and its HORSES with the *right* eye, I say, it is a certain dioptrical result of this act, that the *back of the coach in the left eye,* will be *turned toward the faces of the horses in the right eye;* and it is THIS, and *this alone,* that I call a "*preposte-*" "*rous* arrangement," in the "*Fourth Mode of Vision.*"

You will presently find, that my 14th proposition will refute your principle of external direction in the most conclusive manner, *more ways than one.* In the interim; What lenity can you expect from me, insulted as I have been by your scoffing, that I should not hold up so palpable a pair of mistakes as those now exposed? That they must be written down, either to the credit, or the discredit, of your *Optical Judgment* there can be no doubt; because, if your stating of them had been with an unfair intention of turning my proposition into confusion, you would not have paid so dear a price for the baning of it, as the placing of your own optical understanding in such a predicament.

Nor are the mistakes, already pointed out, *all* that you have fallen into, in the passage in question. For you say—"since an inverted picture of the COACH, and also "of the HORSES, is formed in each eye," &c. And herein, it is plain, you have inflicted another death on the conditions of the proposition stated by me:—because, there is *not* a picture of the COACH, *and* ALSO OF *the* HORSES in EACH eye, since that of the COACH is in *one* eye, and that of the HORSES in the *other.* Will any person, who is competent to the subject, readily believe that your words are here quoted with fidelity, when they express such a string of infractions of the conditions of that proposition which you *selected for the sole* subject, and position, from which you were to annihilate my establishment of Vision in the Head?

To come, now, to the *merits* of that refutation of me, which you have built upon the foregoing mass of misstatements.—You commence thus:

"It is a law of vision deduced from observation, and

" universally and demonstrably true, that when a ray of " light, issuing from any point of an external object, falls " on the retina, the point of the object from which the ray " issues is seen"—(let it be remembered here that you follow Dr. Reid in the word " SEEN ;" and do not evince the slightest distinction between SEEING and JUDGING) " in the direction of a line drawn perpendicular to the " retina from the point at which the ray upon it falls. " Now, if from every point in every letter of the inverted " words SƎSꓤOH HƆ∀OƆ, as delineated in the retina," (In other places, I have shewn, you call it "*painted*," which is an infinitely different thing from the *truth* that the impression is " DELINEATED,)"—" we draw lines " perpendicular to the retina till they meet on the paper " before the eye, to which its two axes are directed, " their termination will actually depict the words COACH " HORSES. Hence it follows that the preposterous posi" tion of the inverted images is absolutely necessary to " their being reformed in virtue of the law of vision " already mentioned."

Now, by this single argument, (for you do not so much as hint at any second) you deem the whole edifice of Cerebral Vision dissolved into thin air; and proceed calmly to the work of contempt. Here then I will, for the moment, absolve you from the tissue of mistakes already exposed, and will suppose we are looking, *agreeably with the* EXPRESS CONDITIONS *of my* 14*th Proposition*, at a COACH *with the left eye, and its* YOKED HORSES with the right eye,—the whole equipage looking toward our right side. The result of this will be that, if lines were produced out from the *inverted retinal impression* in the left eye, they would, (exactly as you say,) depict the word COACH *erect* on the paper: And a similar result would follow the word HORSES, depicted in the right eye. *But this result is as requisite* on my scheme as on yours. And, now, mark the consequence. It is demanded by my scheme, as well as by yours, that the *rays of light* issue from the *erect* *word on the paper;* and, *entering the pupil, cross over* and *prick an inverted* impression of the word on the *retina;* which, being RE-CROSSED *behind the retina, must* discharge itself ERECT upon the Sensorium, and this occasions an ERECT COLOR IMAGE of the word *in the* MIND. And, here, my account *recognises the rays of light as a direct integral part of the visual chain.* But your account involves the following absurdities: It does *not* recognise the rays of light as *any part of the visual chain;* but only admits their *collateral instrumentality;* because *your bundle of crossed lines of direction,* (in most cases,) *does not pass through the pupil,* but you imagine it as *passing through the opaque sclerotic coat* of the eye, which is a *wall impervious to sight:* and, when you have embraced this absurdity, *What follows?*—this—that you have a *real bundle of crossed rays of light, and an imaginary bundle of crossed lines of direction;* BOTH *bundles lying, separately, side-by-side,* like two XX*s thus* —rather inclined to one another, the one bundle (*shall we say?*) serving as a *sort of mirage* to the other!

You taunted me with the "*philosophy of fools*" when, with a thrice-Calibanian simplicity, I took *you for a god!* Will you, after this, maintain that Nature works her drama with the double set of puppets which you have assigned to her? According to your Principle, we do not see *either* WITH, or FROM, or BY LIGHT; but we see BY, or FROM, SOME FOREIGN WITCHERY, every time the Enchantress Light waves her wand. But I proceed to your farther refutation.

In order to rescue your principle from being as instructively, as it is certainly, wrecked here; it would be requisite that we should see BOTH the words with *one* eye, or BOTH with *both* eyes; both which cases are altogether in the face of the *conditions.* And, as the case is, it is certain from the laws of dioptrics that, *if the retinal impressions were not* RE-CROSSED BEHIND *the eyes,* we must see the word COACH *not less* *than an inch, or more,* SEPARATE FROM the word HORSES. But this is not all the absurdity in question; For the two words, besides being so far apart, would not be arranged as—"SƎSᴚOH HƆ∀OƆ;"—but they would be arranged so as to look at each other *preposterously—thus* —HƆ∀OƆ———SƎSᴚOH—*the back of the coach being turned toward the faces of the horses.*—See the *two half arrows,* Plate I. in the Treatise.

To bring in, now, my *uncareful* examination of the phenomena of color images from pressures on the eyes; One of these phenomena, systematically described by me in the Treatise so contemned, is this: that, upon pressure on the outer side of each eye-ball, *simultaneously,* the Peacock's Feather caused by the pressure on the left eye, is seen about *an inch and* a half on the right side of the Peacock's Feather that is caused by the pressure on the right eye; *both being seen* AT THE SAME INSTANT OF TIME, *in the presence of each other.* And thus, the actual phenomena in the mind realise the truth of the dioptrical reasoning of my 14th Proposition: *which phenomena I was led to seek, and to detect, by experimenting in consequence of that very dioptrical reasoning.*

Will you, still, call this *stumbling?* Or, Will your ingenuousness demand still farther proofs?

You may discern, here, that the DIRECTION of the seen Feather is *not at all disputed by me:* The DIRECTION is, as you assert, in *that of the opposite* point of the eye-ball to that pressed. But *Direction* is one thing; and *Distance* is another and vastly different thing; and, I predict, you will never attempt to deny that the feather, *which you think belongs to and is situated on the opposite margin* of the one eye, is SEEN *over against the middle* of the other eye. NOW, altogether bowing to your great merit in some other departments of optics; I congratulate you upon our respective situations upon *that end of the optical chain which merges in* LEGITIMATE PNEUMATOLOGICAL SCIENCE.

No reader, of the least competence to the subject, can suppose that I have not a variety of other arguments, equally strong, to adduce. But, Why should I augment the mass, after those which I have here supplied, and when I am so pressed, both by time and limits? I shall merely add that, I think, you will not fall into a farther mistake, by supposing it to be an objection that the *coach and horses* are ACTUALLY SEEN CONNECTED; *whereas*, the *peacock's feathers are* SEEN SEPARATED. Because, the reason of this plainly is that, the *coach* and the *horses* are *delineated* upon parts of the two respective *retinæ* which cause them to MEET BEHIND THE EYES: Whereas, the *two pressures* are upon such *uncorresponding* parts of their respective retinæ, as make their two caused Feathers *occupy localities in the sensorium far apart* from each other. —And, now, Let the Optical world decide between us.

## HEAD THIRD.

### *Your averment before the British Association.*

If my prefixed address to the British Association be read a second time in this place; I may then proceed to the following statement.

In your *Journal of Science for August* 1832, you have a Paper of your own—"*On the Effect of Compression and Dilation upon the Retina.*" And, in a note to that Paper, you say—"*Read before the British Association at Oxford, June* 22, 1832."

The Paper in question extends to *barely three full pages of your Journal;* although the interval of time, from June till August, might well be expected to have brought forth some additional matter to it. And, what is still more surprising, it consists for the greater part of observations on the remarks of Sir Isaac Newton, and of your own; so that you have recorded *only two results* of Pressures, both which you have distinguished by *italics*, in order to impress them the more upon notice; the *whole account of Pressures,* which led to these results, being contained, the *first of them in seven lines*, and the *second in seventeen lines;* The particularity with which I have deemed it necessary to note this diminutiveness of your contribution to the subject, arises from the force of my astonishment at the fact. And I feel it requisite to pledge myself, to those who may not be able to consult your Journal, that the *whole course of pressures*, which you have thus laid before the first Scientific Association in the Country, *as the evidence of your being the Original and Precursor in the Province of Pressures on the Eyes, extends no farther, nor deeper*, than that which I have here reported.

It remains, therefore, that I adduce the evidence of your having proclaimed your right and title to the province in question. And this evidence consists in the leading paragraph of your Paper; which commences in the following terms:—

"THE production of light by a gentle pressure upon "the eye-ball, or by a sudden stroke upon the eye, is a "fact which has been long known, but which, so far as I "know, has never been carefully examined."

Now, by this single sentence you have, in the presence, and under the acquiescence of the British Association, shorn me clean of the latest, and in fact the most promising labor of my life; it being that upon which I had confidently built, as the engine whose force must break through the otherwise desperate obstruction, which a combination of circumstances had opposed to my whole literary life. This, undeniably, your averment has done *directly and immediately*. And, it is no less certain that it is an *act of continuation*, of that sweeping sentence by which, in your Journal for April 1831, you have ruined my credit and prospects. The act now in question, however, is the only one for consideration here: And, at the same time, it is manifest that the very terms of the passage now quoted convey your virtual acknowledgment that your present Paper contains your *first* contribution to the subject; while your express acknowledgment of this will be presently had in evidence.

As the fact of my having been before you, in the province of *Vision from Pressures*, is thus placed beyond the reach of gainsay; it only remains for me to put the question, *as to whether, or not, my examination of the subject has been that which men of science, and of probity, will pronounce to have been* "CAREFUL."

Here then, in the first place, I ask—Is there a man of optical science, and of name, who shall only read the "*Optical Investigation,*" expressed in the 29th and following pages of this Letter; and will then stand up, in the presence of the British Association, and affirm that *it was possible for any man to arrive at the Inclination, or even the Duality, of the Sensorial Tablets of Color Images;* or, yet, at the *other optical expositions* which I have given in the course of that investigation; *who had never gone through a careful* course of pressures in the eyes?

But, What will be judged when I state that you had, previously—*in April* 1832,—read and criticised the *Fifth Section* of my Treatise of Vision, containing thirty-two pages upon *Pressures:* which Section, besides referring to a course of *general* pressures executed twenty years before, contains that systematic account of pressures, with a PLATE, to which I have already referred in a former page of this Letter? And, What shall be farther judged when it is added that the Supplement on *Color Images,*—the substance of which was recognised by an Abstract printed by the Royal Society,—was published in *September* 1831,—nearly a year previously to your arrogation of Priority on this ground; in which Supplement, *besides the whole of its being the certain fruits of my previous Course of Pressures,* I have introduced some farther results of such pressures?

In the Third place; What will be the decision when I mention my Second Supplement, on "*The Sensorium investigated as to Figure by a Course of Pressures on the*

*Eyes,*" which was published in *April*, 1832 — two months before your Paper was read—and in which is laid out the rationale of the *inclination of the Two Sensorial Tablets*, already described above?

If you shall say, that you did not know of the existence of those two Supplements when you wrote your paper; my answer is, that the substance of the first of them was *long before* acknowledged by the Royal Society, to which you belong: and that, besides this, it was not only announced in the METROPOLITAN; but also, most decisively as to the fact, (in succession,) by the SPECTATOR and the ATLAS Journals: And, Who can deny that you *ought* to have seen some of the several advertisements of the *Second* Supplement; especially as it was handsomely noticed in the METROPOLITAN, and the subject was one in which, it is proved, you were deeply interested?

But, I now proceed to adduce evidence of a vastly different complexion touching your foreknowledge of the existence of a "careful examination." And here, therefore, I have to hope for the serious attention of the British Association. And, if you sink the nature and weight of this evidence, with the acquiescence of that honorable body; then, What have I farther to do with that World in whose service I have sacrificed health and life?

When any man writes with insincerity, upon the same subject at two different times; he would require to be either very talented, or very intent upon his purpose, to enable him to avoid inconsistency. In order, therefore, to shew whether this remark bears upon your proceeding, I in the *First* place observe that, in your strictures in question, there are various expressions which, I hope, may satisfy any critical eye that you did not think my labors, in any department, so utterly contemptible as your exterminating sentence has proclaimed them. *Secondly*, As a particular, and a very precious and critical example of this; I now quote the following commencement of one of the heads of your criticisms, page 366.

"The optical readers of this Journal will recollect that "we have had occasion to discuss the analogous subject "of the vision of impressions on the retina. These im"pressions, however, were made with strong light on the "retina, whereas Mr. Fearn has occupied himself princi"pally with the luminous circles produced by pressure on "the eye-ball," &c. Here you add—"but he treats "only of the direction in which they are seen." *But, here I repeat, this is an enormous mis-statement of the fact,* though it cannot alter the case.

Here, then, we have your express declaration, not only that I was your *competitor,* (*though of course your successor,*) on the *general* ground of investigation of the results of *impressions of light on the interior of the retina:* But, in addition to this, we have also your express declaration that I was "PRINCIPALLY" *your predecessor and precursor on the ground of External Pressures on the Eye-ball.* And now, Let it be observed what is the tenor of this your express testimonial, *as far as regards the* "CARE," of my labor in this department. You say, —"whereas Mr. Fearn has occupied himself PRINCIPALLY." Thus, then, you acknowledge that my examination was so extensive as to involve a "*principally;*" which, manifestly, implies that it was *far* more extensive and careful than some other and secondary examination which I had also conducted on the subject. Now, Let any person in the subject answer the question:—Would you have expressly accorded your testimony, to such a competition on the subject, to any writer who had shewn himself to be *only a careless smatterer, or* mere dabbler in it? Would you, (with all your optical acquisitions and honors on your head, and not over given to humility in opposition, or in competition,) Would you have deigned to *describe, as in competition with yours,* any labors by the distinction of *principal,* if those labors had been undeserving the name of a *careful examination?* But, so the fact is, that you have expressly thus described my labors: And I desire not a tittle of farther evidence to complete my case.

Upon this, therefore, I appeal to the honor, the dignity, and the justice, of the British Association. And here, first, repeating your allegation in their presence in June, 1832, that, "SO FAR AS YOU KNOW, *the production of light by pressure on the eye-ball has never been carefully examined;*" I now most earnestly call upon their justice, that they will adjudge this case.*

In the instance of a certain investigation before a great Assembly, within memory, an individual of rank, in delivering his evidence, by some confusion of thought on the spur of the moment, expressed himself in terms which surprised all who heard him. What, then, did that Assembly deem it due to justice, and to their own honor, to order upon the occasion?—But that individual was not speaking as a member of the Assembly; he was only giving his evidence as a stranger: Whereas, you have expressed yourself, in the manner and extent above quoted, as a member of the British Association, in its presence and enjoying its confidence that none of its members, under that sanction, would approach an overstepping of a well-weighed and accurate allegation.—It is plain that no honorable member present could entertain a suspicion, that any labors existed which could cast the slightest cloud over the disk of your averment.

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* In that allegation, you have *concealed from your hearers* your *hostility* to me, by concealing my labors and name. But, in your "Natural Magic," (page 48,) you have *again* given way to *another* burst, in avowal of it. — Speaking of "impressions on the retina;"—you add—"Here we reach the gulf which human intelli-"gence cannot pass, and if the presumptuous mind of man shall "dare to extend its speculations farther, it will do it only to evince "its incapacity, and mortify its pride."—From this startling pitch of language, so foreign to the *general* tone of your amusing style, it is shewn that you can change, from the tone of *friendly advice*, to that of disrecognition; and again to the stern expression of resentment, as suits the occasion: And also shewn, that the spirit of ruin to my credit will not cease of its own accord.

The only question, however, which concerns your intention in this procedure, is, Under what impression did you express yourself? This is not for me to decide: On the contrary, it may be possible that the strength of prejudice may have deceived you: And it will be perfectly welcome to me, if you satisfy the world upon this head. All that I expect of right, and all that I wish is, that the British Association will publickly grant me reparation, by recognising my right to the prior and effective labor in the province of Vision from Pressure on the Eyes. And it is enough for me to urge here, for the justice of that Association, that, whether it shall be judged that the wrong was intentional, or unintentional, it is no less wrong, and ruin,—most certain ruin—to my credit in the scientific world: And that, I have been deprived of my labor, and my prospects, under the shield for the moment of the Association, by an act as unexpected by me as ever was crowned with success in the annals of literature.

Can I, then, fear I shall sink under such an act, now that I have raised my voice against it? Can I fear that the British Association, newly entered upon *life,* and blushing with the expectation of honor from all, will not deem its dignity involved in the matter: to which, if it listen not nor decide upon, I here respectfully submit, it will render itself a party to the act which it sanctions. If this is to be feared, and I yield up my life under the oppression now in evidence; every dust that is blown from my grave will fall on the lustre of the British Association.

*N.B.—Witness my signature to these averments, in forty-eight pages.—Besides which, I claim part of Sir David Brewster's* " TWO RESULTS," *as my prior detection: And I dissent from other parts.*

JOHN FEARN.

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# ILLUSTRATIONS OF RECROSSED VISION.

THE following extracts from a Paper in the Transactions of the Royal Society, by Dr. Wollaston, in 1824, "*On Semi-decussation of the Optic Nerves*," afford so remarkable and complete a confirmation of Recrossed Cerebral Vision, that I deem it of essential moment to add this evidence to the arguments set forth in the present Letter and in my preceding publications on the subject.

Describing an instance of blindness to *one half of the field of vision* which had occurred to himself a *second time;* he says:—" The blindness was first observed, as before, " in looking at the face of a person I met, whose *left* eye " was to my sight obliterated. My blindness was in this " instance the reverse of the former, being to the *right* " (instead of the left) of the spot to which my eyes were " directed; so that I have no reason to suppose it in any " manner connected with the former affection."

He afterwards says:—" It is plain that the cord, which " comes finally to either eye under the name of optic " nerve, must be regarded as consisting of two portions, " one half from the right *thalamus,* and the other half " from the left *thalamus nervorum opticorum.* According " to this supposition, decussation will take place only between the adjacent halves of the two nerves: That portion of the nerve which proceeds from the right *thalamus* to the right side of the right eye passes to its destination without interference; and in a similar manner " the left *thalamus* will supply the left side of the left eye " with one part of its fibres; while the remaining halves " of both nerves, in passing over to the eyes of the opposite sides, must intersect each other, either with or " without intermixture of their fibres."

In fine. In relating his friend's case, Dr. Wollaston says: —" In this case the blindness was at the time, and still is, " entire with reference to all objects situated to the right " of his centre of view."—" He sees what he writes, and " the pen with which he writes, but not the hand that " moves the pen. This affection is, as far as can be observed, the same in both eyes, and consists in the insensibility of the retina on the left side of each eye."

Upon these recorded actual phenomena of ***Half-field Vision,*** **I shall at present only remark that, if Dr. Wollas-**

ton again illumined the world, and I could command him to FEIGN a set of cases in order to confirm Recrossed Cerebral Vision, I could not choose any case more completely in *juxtaposition* with the whole Rationale and phenomena laid out in my several publications on the subject: For, when we press (for example) simultaneously on the *left side of each Eye*, we have TWO *Peacock's Feathers on the right side of the Sensorium*, ONE of them being *more to the right* than the other. Can any force of bias resist this fact, when it is taken in combination with Dr. Wollaston's case of *Half-field Vision?*—The fact of its happening on DIFFERENT SIDES OF THE FIELD OF VISION *at two different times*, renders it an *experimentum crucis* of a very rare value and occurrence.

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TWO remarks, of material importance, had not room for insertion in the body of the Letter. *First.*—ALL NOVICES, (as happened to Sir Isaac Newton, as well as to myself,) have thought with Sir David Brewster that the Peacock's Feather is *in* the opposite MARGIN OF THE SAME *eye that is pressed.* Nor, perhaps, would the cheat be discovered so long as we employed but ONE eye. It is *only upon bringing* BOTH eyes into action that the grand secret of the recrossing is revealed, in all its manifest certainty and consequences.

SECONDLY.—The Advocates of *External Direction* may, still, think it *something* that the Peacock's Feather is *always true to the opposite point of the* EYE to the point impressed: and they may, perhaps, demand a REASON for this. But the wonder must cease when I point out that, the *reason* is because the EYE *and the* SENSORIUM *are*, EACH *of them*, SPHERICAL; so that a PRESSURE (for example) *on the* EXTREME LEFT *of the* LEFT EYE *occasions a* FEATHER *on the* EXTREME RIGHT *of the* SENSORIUM; *which must be, since the* TWO SPHERES *are* TWO CO-OPERATING ORGANS, the PRESSURES *on the* EYE *being* REGISTERED, AS COLOR IMAGES, *no where but* IN THE SENSORIUM.